MARKHAM

Report to: General Committee

Date Report Authored: October 4, 2011

SUBJECT: Energy Performance Reporting and Ontario Reg. 397/11 – Energy Conservation and Demand Management Plans

PREPARED BY: Atiq Rahman, P.Eng., Asset Management
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RECOMMENDATION:

1) That the report titled "Energy Performance Reporting and Ontario Reg. 397/11 – Energy Conservation and Demand Management Plans" be received;

2) And that the high level overview of energy retrofit and renewable energy project performance be received;

3) And that the Markham Energy Conservation Office (MECO) be responsible for leading Markham's collaborative effort to ensure compliance with Ontario Regulation 397/11 – Energy Conservation and Demand Management Plans;

4) And that MECO report back to Council by July 1, 2014 and every five years thereafter with Markham's complete Energy Conservation and Demand Management plan or update for their approval as per Regulation 397/11;

5) And that MECO be delegated authority to compile, publish and submit to the Minister Markham's Energy Consumption and GHG Emission Template starting July 1, 2013 and every year thereafter;

6) And that by December 31st, 2013 and every year thereafter MECO provide to Council a summary of the Energy Consumption and GHG Emission Template submitted to the Minister;

7) And that Staff be authorized and directed to do all things necessary to give effect to this resolution.

EXECUTIVE SUMMARY:

This report has two major components. One is to report back to Council on the major corporate-wide energy retrofit and renewable energy projects and their outcomes by Asset Management. The other component is a review by the Markham Energy Conservation Office (MECO) on Markham's responsibilities under Ontario Regulation 397/11 - Energy Conservation and Demand Management Plans that recently came into effect as required in the Green Energy and Green Economy Act (GEGEA) of Ontario in 2009.

PURPOSE:

The purpose of the report is to review the energy upgrades completed to date at Town facilities, and the outcomes of these upgrades. Additionally this report will discuss the new Ontario Regulation 397/11 Energy Conservation and Demand Management Plans introduced in the GEGEA.

BACKGROUND:

In 2006, the first comprehensive energy retrofit project was proposed for Milliken Mills Community Centre. After completing a detailed energy audit and significant research, a number of retrofit measures were selected to be implemented by March 2008. The intention of this retrofit project was to mitigate climate change by reducing this facility's Greenhouse Gas (GHG) emissions and to reduce energy costs to operate this facility.

Staff presented the Milliken Mills Energy Retrofit summary to the Council in May 2008, and was requested to report back with the actual energy savings after two years.

In 2008, staff also looked into implementing energy saving measures in Centennial Community Centre. Overview of this retrofit is also a part of this report.

Since then Council and Staff took initiative to incorporate energy saving measures and green technologies in newly constructed facilities. As a result, Fire Station 93 (Cathedral Fire Station) and the Museum Collections Building are both equipped with Ground Source Heat Pump (GSHP) systems.

Markham used some of the 2009 Federal and Provincial Stimulus Funds to invest in various energy conservation and renewable energy measures, including:

1. Solar thermal pool water heating system
2. Solar photovoltaic (PV) renewable energy generation
3. Waste heat recovery from swimming pool drain water
4. Building envelope improvements
5. Building Automation System (BAS) integration, improvement and centralization
6. Lighting retrofit with higher efficiency lamps, fixtures and controls
7. CO2 based ventilation control
8. Variable Frequency Drives (VFD) to optimize fan and pump speed
9. High efficiency boiler retrofit

The Green Energy Act released in 2009 contained a directive for a regulation for the broader public sector (BPS, also known as Municipal, University, Schools and Hospitals (MUSH)) to develop and report their energy conservation and demand management plans. In August of this year the Province enacted Ontario Regulation 397/11 Energy Conservation and Demand Management Plans.

MECO has been tracking and providing comments on the development of regulation 397/11 through its seat on the Association of Municipalities of Ontario's (AMO) Energy Task Force since May of 2011.

OPTIONS/ DISCUSSION:

Below is a high level summary of major energy projects completed to-date:

Facility	**Milliken Mills Community Centre**
Year and energy measures completed	2008 • Solar Pool Heating System • Waste Heat Recovery from Swimming Pool Drain • Control Integration

	• Lighting Retrofit /Day-lighting control of Corridor • High efficiency Condensing Boiler Upgrade
Actual Capital Cost	$315,000
Annual Savings ($)	$68,000 (Comparing two years post-retrofit cost to one year pre-retrofit cost).
Payback (yrs)	5 Years
Environmental benefit	Reduced GHG emissions, onsite renewable energy
Observations	Electricity and natural gas savings are realized to be around 9% and 29% respectively, and are expected to continue.
Budget Impact	Since 2008 the energy budget has been reduced by $68,000.

Facility	**Centennial Community Centre**
Year and energy measures completed	2010 • Solar Pool Heating System • Waste Heat Recovery from Swimming Pool Drain
Actual Capital Cost	$102,000
Annual Savings ($)	$17,000
Payback (yrs)	6 Years
Environmental benefit	Reduced GHG emissions, onsite renewable energy
Observations	Originally planned replacement of the boiler with high efficiency condensing boiler was not implementable due to operational constraints.
Budget Impact	The $17,000 savings has been incorporated into the budget.

Facility	**Fire Station 93 (Cathedral Fire Station)**
Year and energy measures completed	2010 • Ground Source Heating and Cooling
Actual Capital Cost	$180,000 (Premium for the Ground Source system over conventional heating and cooling system)
Annual Savings ($)	$4,800 (based on utility data available to-date)
Payback (yrs)	38 Years
Environmental benefit	Reduced GHG emissions, no onsite fossil fuel burning
Observations	Energy savings of approximately 64% is based on the comparison of the actual consumption of this station and Bur Oak station, which is the same size but using the CHC system. Payback year is high because of the higher price of electricity than natural gas.
Budget Impact	The $4,800 savings has been incorporated into the budget.

Facility	**Museum Collections Building**
Year and energy measures completed	2011 Ground Source Heating and Cooling
The ground source system in this facility is similar to the system at the Fire Station 93. There are insufficient utility data available to-date to analyze this facility.	
Budget Impact	The budget has incorporated the anticipated energy savings from the new system.

Facility	**8100 Warden Avenue**
Year and energy measures completed	2010 • 250 kW Solar Photovoltaic System with a FIT contract for $0.713/kWh produced for 20 years
Actual Capital Cost	$1.7M ($1.2m from Stimulus Fund and $0.5m from LifeCycle Reserve)
Annual Revenues ($)	$174,000 (from Dec. 23 2010 to Oct. 14, 2011; annualized amount $189,819)
Payback (yrs)	3 Years (actual payback on LifeCycle funds)

Environmental benefit	Offset conventional generation GHG emissions
Observations	Renewable electricity generated to-date (October 14, 2011) is 243,938kWh. Actual revenue has been observed to slightly exceed the expected revenue at $178,000/yr
Budget Impact	The energy revenues will be transferred to the Life Cycle Reserve to pay back the up-fronted capital project cost, and the rest of which will be directed per a forth coming MECO policy.

Facility	**Markham Civic Centre**
Year and energy measures completed	2010 • 9.6kW Solar PV System with a microFIT contract for $0.802/kWh produced for 20 years
Actual Capital Cost	$131,250
Annual Revenue ($)	$5,993 (7 months of actual; annualized amount $10,274)
Payback (yrs)	13 years
Environmental benefit	Offset conventional generation GHG emissions
Observations	Capital cost was higher than expected due to change in grid connection requirements.
Budget Impact	The energy revenues will be transferred to the Life Cycle Reserve to pay back the up-fronted capital project cost, and the rest of which will be used to offset the annual hydro costs.

Town-wide Facility Improvement Measures (FIMs)

(Actual cost savings are not available as these are recently implemented measures. Total capital costs for the following FIM projects is $1.8m, of which $1.2m is funded from the Stimulus Funds and $0.6m funded by the Town of Markham.)

FIM	**Locations**	**Completion Date**
Building Envelope Improvement	8100 Warden, Markham Village Library, Thornlea Pool	June, 2010
Variable Speed Drives	8100 Warden, Thornlea School Pool, Armadale C.C, Angus Glen, Civic Centre, Rouge River C.C	July, 2010
Control Upgrade	8100 Warden, Markham Village Library, Armadale C.C, Angus Glen, Civic Centre, Rouge River, Art Gallery	March 2010
Pool Waste heat recovery	Angus Glen C.C.	July, 2010
Lighting Control and retrofit	Thornlea School Pool, Thornhill Community Centre, Armadale C.C, Civic Centre, Rouge River C.C	March, 2011
Replace Standard Efficiency Motors with Hi-efficiency Motors	8100 Warden, Thornlea School Pool, Thornhil C.C, Armadale C.C	September, 2010
Boiler Plant Upgrade	Thornlea School Pool, Angus Glen C.C	September, 2010
CO2 Ventilation Control	Angus Glen C.C, Civic Centre	July, 2010
CIMCO Icepad Control	10 Icepads throughout the Town	February, 2011
Parking Lot Lighting Retrofit	Angus Glen Parking Lot	February, 2011
De-oxigenation System for Icepad flooding	Centennial C.C, Angus Glen C.C, Thornhill C.C, Civic Centre	February, 2011

Ontario Regulation 397/11 Energy Conservation and Demand Management Plans requires the following of Markham:

- Completion, publication and submission to the Minister Markham's Energy Consumption and Greenhouse Gas Emission Template for one year of operations by July 1, 2013 and annually thereafter;
- Development and publication of a detailed energy conservation and demand management plan with targets approved by senior management by July 1, 2014;
- By July 1, 2019 and every five years thereafter publish an update to the original plan that reviews measures implemented, their actual results and forecasts planned measure impacts and any changes made to achieve our targets.

The full regulation and reporting template are attached with this report as ATTACHMENT "A" and "B".

Energy conservation typically means reducing the total amount of energy used (kWh of electricity, m3 of natural gas), demand management refers to reducing the amount of electricity (kW) required at any one time and/or during peak periods. Only electricity is demand managed because natural gas infrastructure is not capacity or supply limited.

Further Council can expect MECO to develop in partnership with all facility stakeholders, including Asset Management, Recreation, Fire, Culture, Operations, Finance and others, Markham's Energy Conservation and Demand Management Plan (EC&DM Plan) for presentation and approval by July 1, 2014 and the five year updates thereafter. The EC&DM plan is required to include:

- Information on the public agency's annual energy consumption during the last year for which complete information is available for a full year,
- The public agency's goals and objectives for conserving and otherwise reducing energy consumption and managing its demand for energy,
- The public agency's proposed measures under its energy conservation and demand management plan,
- Cost and saving estimates for its proposed measures,
- A description of any renewable energy generation facility operated by the public agency and the amount of energy produced on an annual basis by the facility,
- A description of,
    - the ground source energy harnessed, if any, by ground source heat pump technology operated by the public agency,
    - the solar energy harnessed, if any, by thermal air technology or thermal water technology operated by the public agency, and
    - the proposed plan, if any, to operate heat pump technology, thermal air technology or thermal water technology in the future,
- The estimated length of time the public agency's energy conservation and demand management measures will be in place, and
- Confirmation that the energy conservation and demand management plan has been approved by the public agency's senior management.
- Optionally we may publish information with respect to any other operations; for example streetlight and vehicle fuel consumption and emissions

In addition to the required elements, the EC&DM Plan will include processes to simplify the review and analysis of facility energy consumption for Staff.

Markham's past, current and planned energy initiatives; including energy conservation measures, renewable energy measures and the establishment of the Markham Energy Conservation Office and the Greenprint goal of net zero energy by 2050 have well positioned us to take a leadership role in responding to this regulation.

FINANCIAL CONSIDERATIONS AND TEMPLATE

Finance has reviewed and confirmed the financial information included in this report.

HUMAN RESOURCES CONSIDERATIONS

Not applicable

ALIGNMENT WITH STRATEGIC PRIORITIES:

This report is in accordance with the Greenprint and Environmental Strategic Priority of the Town of Markham.

BUSINESS UNITS CONSULTED AND AFFECTED:

This report has been reviewed by Finance for accuracy in energy cost savings and FIT /microFIT revenue estimation.

RECOMMENDED BY

Gary Adamkowski, P.Eng.
Director, Asset Management

Graham Seaman, P.Eng.
Manager, Climate Change and Energy

Brenda Librecz
Commissioner, Community & Fire Services

ATTACHMENTS:
ATTACHMENT "A": ONTARIO REGULATION 397/11
ATTACHMENT "B": Proposed Energy Consumption and GHG Emission Template

ATTACHEMENT "A"

ONTARIO REGULATION 397/11

made under the

GREEN ENERGY ACT, 2009

Made: August 17, 2011
Filed: August 23, 2011
Published on e-Laws: August 25, 2011
Printed in *The Ontario Gazette*: September 10, 2011

ENERGY CONSERVATION AND DEMAND MANAGEMENT PLANS

Definitions

1. In this Regulation,

"municipal service board" means,

(a) a municipal service board or joint municipal service board established or continued under the *Municipal Act, 2001*,

(b) a city board or joint city board established or continued under the *City of Toronto Act, 2006*, or

(c) a joint board established in accordance with a transfer order made under the *Municipal Water and Sewage Transfer Act, 1997*; ("commission de services municipaux")

"post-secondary educational institution" means a university in Ontario, a college of applied arts and technology in Ontario or another post-secondary educational institution in Ontario, if the university, college or institution receives an annual operating grant; ("établissement d'enseignement postsecondaire")

"public hospital" means,

(a) a hospital within the meaning of the *Public Hospitals Act*, or

(b) the University of Ottawa Heart Institute/Institut de cardiologie de l'Université d'Ottawa; ("hôpital public")

"school board" means a board within the meaning of the *Education Act*. ("conseil scolaire")

Application

2. Sections 4, 5 and 6 apply only to public agencies prescribed by section 3.

Public agencies

3. The following are prescribed as public agencies for the purposes of the Act:

1. Every municipality.

2. Every municipal service board.

3. Every post-secondary educational institution.

4. Every public hospital.

5. Every school board.

Energy conservation and demand management plans

4. (1) A public agency shall prepare, publish, make available to the public and implement energy conservation and demand management plans or joint plans in accordance with sections 6 and 7 of the Act and with this Regulation.

(2) An energy conservation and demand management plan is composed of two parts as follows:

1. A summary of the public agency's annual energy consumption and greenhouse gas emissions for its operations.

2. A description of previous, current and proposed measures for conserving and otherwise reducing the amount of energy consumed by the public agency's operations and for managing the public agency's demand for energy, including a forecast of the expected results of current and proposed measures.

Summary of annual energy consumption and greenhouse gas emissions

5. (1) Subject to subsection (2), a summary of the public agency's annual energy consumption and greenhouse gas emissions must include a list of the energy consumption and greenhouse gas emissions for the year with respect to each of the public agency's operations that are set out in Table 1 of this Regulation for the type of public agency to which the public agency belongs and that are conducted in buildings or facilities the public agency owns or leases that,

(a) are heated or cooled and in respect of which the public agency is issued the invoices and is responsible for making the payments for the building or facility's energy consumption; or

(b) are related to the treatment or pumping of water or sewage, whether or not the building or facility is heated or cooled, and in respect of which the public agency is issued the invoices and is responsible for making the payments for the building or facility's energy consumption.

(2) If only part of a building or facility where an operation is conducted is heated or cooled, the public agency's summary referred to in subsection (1) must only include energy consumption and greenhouse gas emissions for the part of the building or facility where the operation is conducted that is heated or cooled.

(3) The public agency's summary referred to in subsection (1) must be prepared using the form entitled "Energy Consumption and Greenhouse Gas Emissions Template"

that is available from the Ministry and must include the following information and calculations for each of the public agency's operations:

1. The address at which the operation is conducted.
2. The type of operation.
3. The total floor area of the indoor space in which the operation is conducted.
4. A description of the days and hours in the year during which the operation is conducted and, if the operation is conducted on a seasonal basis, the period or periods during the year when it is conducted.
5. The types of energy purchased for the year and consumed in connection with the operation.
6. The total amount of each type of energy purchased for the year and consumed in connection with the operation.
7. The total amount of greenhouse gas emissions for the year with respect to each type of energy purchased and consumed in connection with the operation.
8. The greenhouse gas emissions and energy consumption for the year from conducting the operation, calculating,
   i. the annual mega watt hours per mega litre of water treated and distributed, if the operation is a water works,
   ii. the annual mega watt hours per mega litre of sewage treated and distributed, if the operation is a sewage works, or
   iii. per unit of floor space of the building or facility in which the operation is conducted, in any other case.

(4) If a public agency conducts, in the same building or facility, more than one operation set out in Table 1 of this Regulation for the type of public agency to which the public agency belongs, it shall make a reasonable allocation of the amount of energy purchased and consumed for the year among each of those operations.

(5) In preparing its annual Energy Consumption and Greenhouse Gas Emission Template, a public agency may exclude its energy consumption and green house gas emissions relating to its temporary use of an emergency or back-up generator in order to continue operations.

(6) On or before July 1, 2013, every public agency shall submit to the Minister, publish on its website and intranet site, if it has either or both, and make available to the public in printed form at its head office the public agency's Energy Consumption and Greenhouse Gas Emission Template for operations conducted in 2011.

(7) On or before July 1 of each year after 2013, every public agency shall submit to the Minister, publish on its website and intranet site, if it has either or both, and make available to the public in printed form at its head office the public agency's Energy

Consumption and Greenhouse Gas Emission Template for operations conducted in the year following the year to which the last annual Template related.

(8) The following information, if applicable, must also be submitted, published and made available to the public with every Energy Consumption and Greenhouse Gas Emission Template:

1. If the operation is a school operated by a school board,

    i. the number of classrooms in temporary accommodations at the school during the year, and

    ii. whether there is an indoor swimming pool in the school.

2. If the public agency is a public hospital, whether a facility operated by the public hospital is a chronic or acute care facility, or both.

Energy conservation and demand management measures

6. (1) On or before July 1, 2014, every public agency shall publish on its website and intranet site, if it has either or both, and make available to the public in printed form at its head office,

(a) the information referred to in subsection 6 (5) of the Act with respect to each of the public agency's operations set out in Table 1 of this Regulation for the type of public agency to which the public agency belongs;

(b) the information referred to in paragraph 2 of subsection 4 (2) of this Regulation with respect to each of the public agency's operations set out in Table 1 of this Regulation for the type of public agency to which the public agency belongs; and

(c) the following information:

(i) information on the public agency's annual energy consumption during the last year for which complete information is available for a full year,

(ii) the public agency's goals and objectives for conserving and otherwise reducing energy consumption and managing its demand for energy,

(iii) the public agency's proposed measures under its energy conservation and demand management plan,

(iv) cost and saving estimates for its proposed measures,

(v) a description of any renewable energy generation facility operated by the public agency and the amount of energy produced on an annual basis by the facility,

(vi) a description of,

(A) the ground source energy harnessed, if any, by ground source heat pump technology operated by the public agency,

(B) the solar energy harnessed, if any, by thermal air technology or thermal water technology operated by the public agency, and

(C) the proposed plan, if any, to operate heat pump technology, thermal air technology or thermal water technology in the future,

(vii) the estimated length of time the public agency's energy conservation and demand management measures will be in place, and

(viii) confirmation that the energy conservation and demand management plan has been approved by the public agency's senior management.

(2) In addition to publishing and making available the required information with respect to the operations mentioned in clauses (1) (a) and (b), a public agency may also publish information with respect to any other operation that it conducts.

(3) On or before July 1, 2019 and on or before every fifth anniversary thereafter, every public agency shall publish on its website and intranet site, if it has either or both, and make available to the public in printed form at its head office all of the information that is required to be published and made available under subsection (1), the Energy Consumption and Greenhouse Gas Emission Template that is required to be submitted and published on or before July 1 of that year and the following information:

1. A description of current and proposed measures for conserving and otherwise reducing energy consumption and managing its demand for energy.

2. A revised forecast of the expected results of the current and proposed measures.

3. A report of the actual results achieved.

4. A description of any proposed changes to be made to assist the public agency in reaching any targets it has established or forecasts it has made.

(4) If a public agency initiated energy conservation measures or energy demand management measures before July 1, 2014, the public agency may also include in its first plan information on the results of those measures.

TABLE 1

Column 1	Column 2	Column 3
Item	Type of public agency	Operation
1.	Municipality	1. Administrative offices and related facilities, including municipal council chambers.
		2. Public libraries.
		3. Cultural facilities, indoor recreational facilities and community centres, including art galleries, performing arts facilities, auditoriums, indoor sports arenas, indoor ice rinks, indoor swimming pools, gyms and indoor courts for playing tennis, basketball or other sports.
		4. Ambulance stations and associated offices and facilities.

		5. Fire stations and associated offices and facilities.
		6. Police stations and associated offices and facilities.
		7. Storage facilities where equipment or vehicles are maintained, repaired or stored.
		8. Buildings or facilities related to the treatment or pumping of water or sewage.
		9. Parking garages.
2.	Municipal service board	1. Buildings or facilities related to the treatment or pumping of water or sewage.
3.	Post-secondary educational institution	1. Administrative offices and related facilities.
		2. Classrooms and related facilities.
		3. Laboratories.
		4. Student residences that have more than three storeys or a building area of more than 600 square metres.
		5. Student recreational facilities and athletic facilities.
		6. Libraries.
		7. Parking garages.
4.	School board	1. Schools.
		2. Administrative offices and related facilities.
		3. Parking garages.
5.	Public hospital	1. Facilities used for hospital purposes.
		2. Administrative offices and related facilities.

Commencement

7. This Regulation comes into force on the later of January 1, 2012 and the day it is filed.

Ontario

Ministry of Energy

Proposed Energy Consumption and GHG Emission Template (Provided as an Excel spreadsheet):

Facility Name/ Type	Address	Year built	Total gsf*	Facility Hours of Use (e.g., 9-5, 24/7, ice hours for arenas)	Fuel Type	Current Emission Factor (pre-populated)	Energy consumed (ekWh/yr)	GHG Emissions (tonnes CO2e/yr)	GHG Intensity (tonnes CO2e/gsf)	Energy Intensity (ekwh/gsf)
					Electricity					
					Natural Gas					
					Propane					
					Diesel					
					Steam					
Total by Facility Type										
Overall Agency Totals										

* Gross square footage (gsf) includes conditioned underground parking (heated and lit) and heated walkways.

Where a bulk meter is used for a number of buildings, energy use and GHG emissions would be determined by allocating total energy or GHG emissions by the associated buildings area.

Schools should note the number and gsf of portables, and if a pool or daycare centre is connected to the school.

Hospitals should note if they are chronic or acute/teaching facilities.