

Re:	2013 Corporate Energy Management Update		
From:	John Irving, P.Eng, MPA Director, Engineering and Public Works	File:	10-6000-01/2013-Vol 01
То:	Public Works and Transportation Committee	Date:	November 1, 2013

### **Staff Recommendation**

That the staff report titled "2013 Corporate Energy Management Program Update Report" from the Director of Engineering and Public Works, dated November 1, 2013 be received for information.

John Irving, P.Eng, MPA Director, Engineering (604-276-4140)

Att. 2



### Staff Report

## <u>Origin</u>

The Corporate Energy Management Program (EMP) supports the following Council Term Goal;

Council Term Goal #8.1: "<u>Continued implementation and significant progress towards</u> <u>achieving the City's Sustainability Framework</u>, and associated targets.

The EMP is a key contributing program towards achieving the Sustainability Framework Goals of a Sustainable Resource Use-Energy Smart City and Climate Prepared City.

This report summarizes the recent achievements of the Corporate EMP and highlights upcoming initiatives. The report information is also summarized in an attached brochure, to further illustrate key information and highlights of recent City energy projects and initiatives (Attachment 1).

### Energy Management Program - Overview

The City has been following three corporate strategies, as adopted by Council in the Energy Sustainability Strategic Program, to guide the transition towards more sustainable energy use and lower greenhouse gas (GHG) emissions;

- 1. Empower building awareness and capacity
- 2. **Reduce** reduce overall energy consumption through conservation and efficiency
- 3. **Renew and Localize** accelerate transition to locally supplied renewable and clean energy

To put these strategies into actions, the corporate EMP has been focused on three main areas;

- 1. Energy conservation reduce the overall demand for an energy service (e.g., increased corporate energy use awareness and improved operational control to reduce waste)
- 2. Energy efficiency reduce the energy required to provide an equivalent energy service (e.g. lighting retrofits to more efficient technologies)
- 3. **Renewable and clean energy** increase the use of renewable energy sources and reduce the carbon intensity of emissions resulting from an energy service (e.g. installation of solar thermal energy systems at existing facilities)

The Energy Management Program, through these strategies and actions, is a major component of the Towards Carbon Neutrality Implementation Strategy. An overview of key energy management initiatives connected with the Towards Carbon Neutrality Implementation Framework is provided in the report to council titled Towards Carbon Neutrality: Implementation Strategy.

In addition to the Sustainability Framework and Carbon Neutral goals and targets, the City of Richmond, in collaboration with BC Hydro, agreed to a reduction target of approximately 1.3% or 650,000 kWh in corporate electrical use by April 2014 from 2012 levels, which is equal to the energy used by approximately 20 homes in BC per year. The City of Richmond is presently on-pace to better this target by early 2014. This target and the continued collaboration with BC

Hydro helps to maximize the incentive funding from BC Hydro (one of our key EMP external funding partners), and allows for the continued development and delivery of projects.

## EMP Achievements - 2007-2011 EMP Highlights

Based on the continuing corporate emphasis on increased energy use efficiency, the City of Richmond remains the only municipality in BC to achieve the Leadership Excellence Award recognition from BC Hydro, which is the highest level of recognition BC Hydro awards for energy efficiency and conservation work. New excellence awards will be issued for energy efficiency and conservation work in the fall of 2014.

Energy conservation work at the City and energy related projects have saved approximately 28.4 GWh of energy (equal to the energy consumption in 790 BC homes per year) since 2007, which amounts to approximately \$1,500,000 in total operational cost avoidance and over 5,000 tonnes of greenhouse gas emissions (equal to emissions from 1500 Richmond cars). During that time the City received approximately \$1,000,000 in external funding to help support its EMP, which has been used to proceed with additional and expanded Energy Management projects, increase the repayment of capital funding to the corporate Enterprise Fund for projects related to Energy Management, and develop energy related projects.

### Findings of Fact

## Corporate Energy Use Overview - 2012

The corporate energy manager actively manages or coordinates energy use reporting, inventory, and reduction programs, for all civic buildings, lighting, and water/wastewater services, and in addition reports on energy use at the Richmond Oval.

In 2012 City assets under the EMP consumed approximately \$6.0 million dollars of conventional energy<sup>1</sup> (electricity and natural gas), which equals 80.6 GWh (this is equivalent to the amount of energy used on average each year by approximately 2,300 homes in BC). This total does not include the energy used in our corporate fleet operations. Compared to 2011 the corporate energy consumption for buildings, water/wastewater services, and lighting has remained stable, at the same time that corporate asset inventory has increased.

Energy use at civic buildings accounts for a majority (approximately 82%) of total reported corporate energy use<sup>2</sup>. As shown in the following Figure 1, civic building energy use intensity has decreased from approximately 373 kWh/m2 in 2007 to 326 kWh/m2 in 2012. Decreasing energy use intensity in civic buildings (improving energy use efficiency) demonstrates that corporate energy management is effective.

<sup>2</sup> This total corporate energy use does not include Fleet services.

<sup>&</sup>lt;sup>1</sup> There are civic buildings that have renewable energy systems (e.g. solar thermal hot water heating at Minoru Aquatic Centre), which obtain "free" solar energy that is not accounted for in our total corporate energy use/cost amount.



### EMP Achievements - 2012/2013 EMP Highlights

With the commitment of Council and staff to increased corporate energy use efficiency, it is anticipated that by early 2014 the City will achieve a reduction of approximately 1.4 GWh of electrical and natural gas energy use (approximately 1.8% of current corporate use) from a variety of 2012/2013 energy related projects. This reduction represents approximately \$100,000 in operational cost avoidance savings and a reduction of approximately 170 tonnes of  $CO_2e$  (equal to removing approximately 50 Richmond cars from our roads each year).

Other select highlights of the City's energy management program and other energy related corporate activities from 2012 and 2013 include:

- **External Funding:** Secured over \$100,000 of external funding to support the Corporate Energy Management Program and Sustainability Unit.
- <u>Employee Engagement:</u> Completed Year 3 of a 4-year corporate energy awareness program, branded "Because Energy Awareness Matters (BEAM)" with support of BC Hydro and staff Energy Champions, to promote energy conservation measures with staff.
- <u>Showcase projects:</u> Achieved higher than anticipated energy conservation results for two projects, a heat recovery installation at Minoru Arena and a lighting retrofit at Burkeville tennis courts.
- **Policy Review:** On-going facilitation of a working group to update the Corporate High Performance Building Policy, with emphasis on space functionality, and operational and energy efficiency.
- <u>New Technology</u>: Continued feasibility work on the integration of new high efficient light-emitting diode (LED) street lighting fixtures into the City's street lighting system to displace higher energy using high pressure sodium fixtures.

Further summary of EMP projects highlights in 2012 and 2013 are provided in Attachment 2.

In addition to corporate initiatives listed above, the City, the Engineering Department, and the District Energy Management Program are working on the establishment of new district energy centre locations powered by renewable energy, namely River Green and City Centre. The

development and connecting of renewable energy to new corporate facilities, would allow the City of Richmond to further reduce its corporate greenhouse gas emissions, by displacing more conventional heating and cooling energy sources.

### Future EMP Vision and Goals

In continuation from the Vision and Goals from last year's Energy Update Report, the following main focus areas remain in place for the EMP for 2014;

- Increase energy use awareness within the organization and community
- Pursue external funding and partnerships with outside agencies
- Maintain a leadership role in terms of municipal energy systems and policy
- Improve the "usability" of our energy use data at key facilities, to allow for more detailed analysis and the increased optimization of our energy use
- Incorporate a more systematic approach to building energy use performance analysis and benchmarking of our civic facilities, to allow for the continued improvement of our facilities, and the extension of their usefulness
- Continue to ensure that energy use and GHG emission accounting (in relation to reduction goals) is a high priority during the designing of new facilities and developments

The funding strategy for these programs will be brought forward as part of the operating budget process for consideration by Council.

### Planned Upcoming Capital Projects

There are numerous proposed energy initiatives for 2014, as part of the EMP capital submissions as well as longer term projects, which in summary includes the following key actions items.

- Retro-commissioning of select high consuming buildings
- Completion of building automation system upgrades at several civic facilities
- Lighting retrofits at various facilities, including Minoru Park tennis courts
- Pool heating system optimization at Steveston and South Arm facilities

### **Financial Impact**

There is no financial impact as a result of this report. Capital projects related to energy management are reviewed and approved by Council as part of the capital budget process.

### <u>Conclusion</u>

Through Council's continued commitment to corporate energy efficiency and the collaborative staff effort between departments, energy efficiency awareness is becoming more embedded into the City's corporate culture and decision making processes every year. Cumulatively since 2007, energy conservation projects in buildings at the City have saved approximately 28.4 GWh of energy (equal to the energy consumption in 790 BC homes per year), which amounts to

approximately \$1,500,000 in total operational cost avoidance and over 5,000 tonnes of greenhouse gas emissions reduced (equal to emissions from 1,500 Richmond cars). These efforts have allowed the City to bring on new facilities and infrastructure, without significantly increasing our overall energy use.

Further work and initiatives to increase the effectiveness of the corporate EMP, will focus on maximizing energy efficiency opportunities for new capital projects and replacement equipment, increasing operational efficiencies through building automation systems, and continuing to retrofit existing buildings for improved energy performance. The EMP will also investigate the feasibility of district energy connectivity for replacement of facilities at Minoru Park and other areas of the community where district energy is being implemented.

Levi Higgs Corporate Energy Manager (604-244-1239)

Attachment 1	Energy Report Summary – 2012	REDMS# 4026277
Attachment 2	City Energy Management Program 2011/2012 Key Initiatives	REDMS# 4021018

Attachment 1

# Energy Update Report Summary 2012/2013





# **City Energy Use**

## Overview 2012

- Cost of energy in 2012 for the City of Richmond buildings, lighting, water and wastewater services = \$6.0 million dollars or 80.6 MWh (this is equal to the average power consumed in ~2,300 homes in BC in 1 year).
- Although overall energy use has not decreased as compared to 2011, our building energy use intensity (kWh/m2) continues to decrease. This indicates that corporate energy use efficiency is increasing.
- Although overall energy use has not decreased as compared to 2011, our building energy use intensity (kWh/m2) continues to decrease, which indicates that corporate energy use efficiency is increasing.
- Cumulatively since 2007, energy conservation projects at the City have saved approximately 28.4 GWh of energy (equal to the energy consumption in ~790 BC homes per year), and over 5,000 tonnes of greenhouse gas emissions (equal to emissions from ~1500 Richmond cars).









City of Richmond

# **City Energy Use**

- In 2012, the majority of corporate energy use (excluding fleet services) was by buildings-82%, followed by lighting-11% and water/wastewater services-6%.
- Recreational pools and ice arenas remain our highest energy consuming facilities - with Richmond Olympic Oval, Watermania, Richmond Ice Centre, Minoru Pools and Minoru Arenas accounting for approximately 56% of the energy used by civic buildings in 2012.
- This focus of energy usage on a smaller number of buildings has lead the Energy Management Program to continue to focus its assessment and auditing resources on the higher consuming buildings.
- A further three high consuming buildings, in addition to five that are already in the program, are participating in the BC Hydro continuous optimization (COp) program, which aims to increase energy efficiency by 5-20% through site energy investigations and operational changes.







# **Energy Management**

# Program Highlights 2012/2013

- Secured over **\$100,000** of external funding to support the Energy Management Program.
- The City of Richmond remains the only Municipality recognized by BC Hydro for the City's energy efficiency and conservation work as being a **Power Smart Leader**.
- City is on course to achieving, by early 2014, an estimated reduction of **1.4 GWh** in electrical and natural gas use and approximately **170 tonnes** of greenhouse gas emissions from a variety of current projects.
- This energy reduction represents approximately 1.8% of our current corporate annual energy use and the GHG emissions reduction is equal to removing approximately 50 vehicles from Richmond roads each year. In addition, these energy reductions will result in approximately \$100,000 in operational cost avoidance savings.











# Program Highlights 2012/2013

# **Energy Management**

- Energy Strategic Planning: Development of a yearly building energy audit schedule that aligns with yearly building condition assessments.
- **Policy Review:** Facilitation of a working group to update the Corporate High Performance Building Policy, with emphasis on space functionality, operational and energy efficiency, and the incorporating of building energy use reduction targets.
- Employee Engagement: Completed Year 3 of a 4-year corporate energy awareness program with support of BC Hydro and staff "Energy Champions", to promote energy conservation measures within the corporation.
- Showcase projects: Achieved higher than anticipated energy conservation results for two 2012 projects, a heat recovery installation at Minoru Arena and a lighting retrofit at Burkeville tennis courts. Completed "first of its kind" sanitary sewer heat recovery installation at Gateway Theatre.
- New Technology Integration: Continued feasibility work on the integration of new high efficient light-emitting diode (LED) street lighting fixtures into the City's street lighting system to displace higher energy using high pressure sodium fixtures.











City of Richmond

Minoru Arena Ice Plant Replacement

## **Energy Management Program**

- Continue to implement and work towards corporate goals associated with the Sustainability Framework - Sustainable Resource Use-Energy Smart City and Climate Prepared City, and the Towards Carbon Neutrality Implementation Strategy.
- Research and facilitate the maximizing of energy efficiency opportunities for new capital projects and replacement equipment, increasing operational efficiencies through building automation systems, and continuing to retrofit existing buildings for improved energy performance.
- Complete evaluation of the feasibility of connecting replacement facilities at Minoru Park to a district energy centre.
- Continue to increase energy use awareness within the organization and community.

### Action Items include:

- Finalize the upgrading of our corporate energy use database, to improve energy reporting capabilities and corporate energy use information sharing.
- Finalize the establishment of corporate building energy use targets, to help drive energy efficiency goals within the corporation.
- Continue to align energy management project funding requests with upcoming building improvement projects to maximize co-benefits of coordinating project activities at the same time.
- Complete a building automation system integration plan for new and existing buildings, to increased building operational energy efficiency and analysis capability.







## City Energy Management Program -2012/2013 Key Initiatives

Management Areas	2012/2013 Key Initiatives
Plan	<ul> <li>Energy Strategic Planning:         <ul> <li>Secured over \$100,000 in external funding in the past year to support energy initiatives efficiency initiatives such as;</li> <li>Numerous lighting retrofits and re-lamping projects</li> <li>Funding in Energy Manager and Sustainability Project Manager positions</li> <li>Energy modelling work for new City Centre Community Centre</li> </ul> </li> <li>In the process of updating the Corporate High Performance Building Policy, which will include corporate energy and greenhouse gas emission reduction targets for buildings.</li> <li>Development of a building energy audit schedule that aligns with yearly facility condition assessments, to streamline Energy Management project development.</li> <li>Working with BC Hydro and BC Procurement to establish an LED purchasing guidelines and consortium to lower material costs.</li> </ul>
Do	<ul> <li>Building Capacity         <ul> <li>Workplace conservation Awareness program Year 3 completed (initiatives included What's Watt online challenge, lighting information workshop and a turn down the heat campaign). Program will be continued in 2014.</li> <li>Greater alignment of capital submissions for yearly building improvement and energy management related requests, to ensure that projects are delivered seamlessly (e.g. building envelope work at West Richmond Community Centre delivered at the same time as lighting improvements).</li> <li>Audited natural gas and electricity billing accounts, and are working to streamline billing and energy tracking processes.</li> </ul> </li> </ul>
	<ul> <li>Reducing Energy Use or Displacing conventional energy sources         <ul> <li>Various heating ventilation and air-conditioning unit replacements (South Arm and West Richmond Community Centres, and Public Works Yard)</li> <li>Lighting retrofits and re-lamps at various facilities (e.g. South Arm and Thompson Community Centres, Gateway Theatre, and City Hall)</li> <li>New LED Tennis Court lighting piloted at Burkeville</li> <li>Completion of natural gas use reduction projects at Gateway Theatre that included a major boiler and coupling replacement.</li> </ul> </li> <li>Increasing Financial Security &amp; Stability</li> </ul>
	over \$100,000 in energy and maintenance cost avoidance
Monitor & Report	<ul> <li>Improving Energy Monitoring System         <ul> <li>Corporate energy database is currently being updated to a system with increased functionality (e.g. greater energy use reporting capabilities to stakeholders, and increased efficient reporting function for BC reporting requirements)</li> <li>Inclusion of three additional facilities in to the BC Hydro Continuous Optimization program (Steveston and South Arm Community Centres, and the Works Yard), which includes the installation of real-time energy monitoring devices</li> </ul> </li> </ul>
	Reporting Performance         •       Annual Corporate-wide Energy update report to Council         •       Semi-Annual reporting to Senior Management, on Energy Management Program status and work plan         •       Quarterly reporting to BC Hydro – currently on pace to meet established BC Hydro electricity reduction targets for this year         •       Interdepartmental quarterly reporting of Energy Management project status
Innovate & Improve	Exploring New Approaches and Technologies         •       The following projects and feasibility of further evaluation will be assessed in the coming months         •       Corporate LED parking lot lighting retrofit implementation         •       Upgrade of building control systems, to fully web-based         •       Mini district energy centre for corporate precinct, as part of Minoru re-development         •       Street light LED change over project plan evaluation and development         •       BC Hydro energy management system assessment to be conducted in the fall.