



To: Public Works and Transportation Committee
From: Cecilia Achiam, MCIP, BCSLA
 Interim Director, Sustainability and District Energy
Re: **2011 Corporate Energy Management Update**

Date: October 6, 2011
File: 01-0103-65-20-06/Vol
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Staff Recommendation

That the staff report entitled "2011 Corporate Energy Management Program Update Report" from the Interim Director, Sustainability and District Energy, dated September 19, 2011 be received for information

Cecilia Achiam, MCIP, BCSLA
 Interim Director, Sustainability and District Energy
 (604-276-4122)

Att. 4

FOR ORIGINATING DEPARTMENT USE ONLY					
ROUTED TO:		CONCURRENCE		CONCURRENCE OF GENERAL MANAGER	
Project Development		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>			
Engineering		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>			
REVIEWED BY TAG		YES	NO	REVIEWED BY CAO	
		<input checked="" type="checkbox"/> <i>R</i>	<input type="checkbox"/>	<i>GI</i> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>	

Staff Report

Origin

This Corporate Energy Management Program Update Report summarizes the City’s most recent achievements in implementing the City of Richmond’s Energy Management Program (EMP) and highlights upcoming corporate energy management initiatives. The City’s EMP closely supports the Corporate Sustainability Framework-Energy Sustainability Strategic Program endorsed by Council on July 26, 2010 (**Attachment 1**).

The EMP also supports the following Council Term Goals

Council Term Goal #2: “*Financial Responsibility and Levels of Service* – Ensure the City has the capacity to meet the financial challenges of today and in the future, while maintaining appropriate levels of service”; and

Council Term Goal #7: “*Sustainability and the Environment* – Demonstrate leadership in and significant advancement of the City’s agenda for sustainability through the development and implementation of a comprehensive strategy that among other objectives includes incorporating sustainability into our City policies and bylaws”.

Included with this Energy Management Program Update report as **Attachment 2**, is a summary brochure highlighting key City energy projects and initiatives.

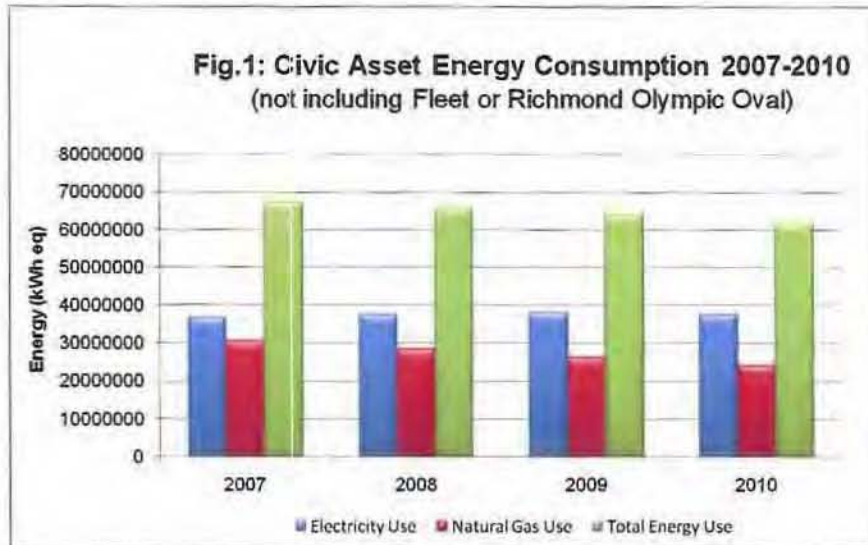
Background

Energy Use Overview

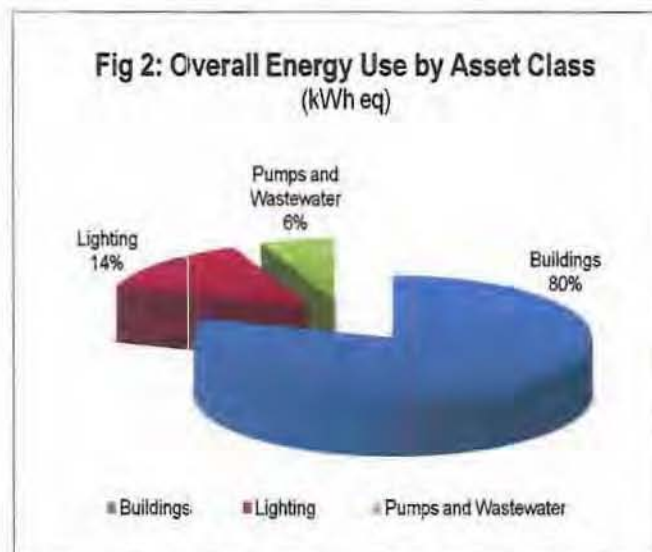
In 2010 the City of Richmond civic assets, which includes buildings, lighting, and pumps and wastewater (but excluding Fleet and the Richmond Olympic Oval) utilized approximately \$4.4 million dollars of energy, or approximately 61,573,000 kWh (electricity and natural gas). The Oval has not been incorporated into the City’s inventory for 2010 because of arrangements for the 2010 Games and the legacy conversion period after the Games. The Oval will be included from 2011 going forward. Excluding the Oval, Compared with 2009 the cost of our civic assets’ energy use (excluding the Oval) increased from approximately \$4.0 million dollars for that year; however, the amount of energy utilized decreased in 2010 by approximately 2,611,000 kWh - from 64,184,000 kWh used in 2009. The increased cost of energy was mostly due to increases in electricity rates.

	2009	2010	Variation
Energy Use (kilowatt hours)	64,184,000 kWh	61,573,000 kWh	2,611,000 kWh reduction
Energy Cost	\$4.0 M	\$4.4 M	approx. \$400,000 increase

The following Figure 1 indicates the amount of energy used by the City for civic assets between 2007 and 2010, and includes a breakdown of natural gas and electricity use.



As is shown in the following Figure 2, energy use at civic buildings accounted for approximately 80%, lighting accounted for approximately 14%, and pumps and wastewater systems accounted for approximately 6% of the total energy utilized by civic assets, or approximately 48,676,000 kWh (electricity and natural gas), 8,792,000 kWh, and 3,901,000 kWh, respectively.



The City of Richmond is responsible for the utility costs at approximately 90 civic facilities. However of the 90 civic facilities under City stewardship, energy use in 2010 at only 11 facilities

accounted for over 80% of the overall civic building energy use – with our recreational pools and ice arenas being the highest energy consuming facilities¹.

This large percentage of civic energy used by a small number of facilities emphasizes the potential opportunity for excellent return on investment for energy management initiatives at these locations foremost. In addition, placing a high priority on efficient energy system design during the development phase of new facilities (specifically pools and ice arenas), will go a long way in ensuring that our corporate energy and GHG reduction targets can be met in the long term.

Although the City has been able to achieve excellent results in energy conservation, infrastructure has increase (e.g. The Olympic Oval). So while the unit cost of energy consumption has gone down, it is anticipated that total energy consumption and green house gas emissions will increase as the City add infrastructure to meet the growing needs of our residents. This, combined with increasing utility rates, will result in energy costs increases going forward.

Energy Management Policy and Program Development Overview

Energy conservation and its efficient use were first brought forward as a Council and corporate priority in 1991 with the Energy Conservation Policy. Some key points from that policy are still relevant for our current corporate energy management program. These points include; considering life cycle costing when purchasing new equipment, upgrading facilities to highest possible efficiency as budgets allow, monitoring civic energy consumption, maintaining equipment to energy efficient standards, and encouraging all employees to suggest and initiate projects that will save energy.

In order to expand on the initial energy conservation policy, and to set specific management objectives and evaluation criteria for the “sustainable” development of our buildings, Council rescinded the Energy Conservation Policy in 2004 and adopted the High Performance Building Policy in its place. This policy enabled the broadening of the City’s commitment to efficient natural resource use in all areas of civic functions, established the Leadership in Energy and Environmental Design (LEED) rating system as the “sustainable” measurement tool for new buildings and major renovations, and set clear objectives for management in terms of project cost considerations and integrated building design practices. This policy also set the City apart from other municipalities at the time by adopting specific LEED standard objectives for new construction, with a minimum of LEED Gold or Silver accreditation² for all new buildings. Since adoption of the High Performance Building Policy by Council tangible results have been evident with exceptionally well designed new and renovated civic buildings, and high levels of incorporation of energy efficient technologies.

During the time that the High Performance Building Policy was being developed, energy management retrofit projects were being implemented at numerous existing civic buildings by Facilities Department in partnership with BC Hydro. These projects were highly successful in increasing building energy efficiency and leveraging external funding to support our energy management program. Based on Council’s commitment to increased energy efficiency and the

¹Watermania, Richmond Ice Centre, Minoru Pools and Minoru Arenas accounted for 43% of the overall civic building energy use in 2010.

² For new buildings under 2,000 m², the performance standards for LEED Silver accreditation were to be met without necessarily seeking formal accreditation. For buildings over 2,000 m², LEED Gold accreditation was to be required.

success of the implemented projects, the City has been recognized by BC Hydro as a Power Smart Leader on numerous occasions, beginning in 2003 and most recently in 2010; and remains the only Municipality to have achieved this level of recognition.

Findings Of Fact

Current State of the City' EMP

Although the continued reduction of electricity use is warranted and desired, it has been recognized by Council that to achieve the City's ambitious GHG and energy reduction targets, it will necessary to explore and implement other energy saving measures beyond those mandated by the BC Hydro Power Smart program. These measures potentially include reducing consumption of natural gas (which is a much more significant GHG contributor than hydro electricity), and shifting to alternative modes of energy production including solar, geothermal and other low GHG emitting alternatives.

As a result of the recognition of the necessity of a larger scope of work for the City Energy Manager, the continued successful development of the City of Richmond Energy Management Program, and the adoption of the City's Sustainability Framework – Energy Sustainability Strategic Program, Council approved the establishment of a full time Energy Manager position in February 2011. This resulted in the City devoting its full attention to achieving the City's energy reduction goals and targets.

The emphasis of the scope of work under the EMP has now shifted from being driven by the availability of external grant and incentive funding to focus more fully on the City's Sustainability Framework and operational needs. In addition, the EMP can now look to further develop internal systems to allow for the enhanced sharing of energy information between departments, the increased quality of energy data, and the increased quality of energy management project evaluation and implementation.

2010 and 2011 Achievements

Since 2010, the City's EMP has been busy with multiple projects, and strategic planning to align the program with the City's Sustainability Framework and to continue the program's development.

Select highlights of the City's EMP from 2010 and 2011 include;

- The securing of approximately \$500,000 of external funding to support the Corporate Energy Management Program
- The installation of solar thermal hot water systems to pre-heat water at Steveston Outdoor pool³, South Arm Outdoor Pool, and Minoru Pool – the project consisted of installing approximately 20 solar thermal panels at each location in conjunction with the upgrading of the facilities boilers

³ Project under construction and scheduled to be completed by October 31, 2011.

- The facilitation of a ballast and lighting retrofit, in conjunction with the Oval Corporation, for the Richmond Olympic Oval, which is estimated to save approximately 500,000 kWh of electrical energy per year. Other lighting control measures that are being implemented by the Oval Corporation at the same time will increase the energy savings of this project to approximately 1,000,000 kWh, or approximately \$70,000 annually in cost avoidance due to energy savings
- The development of a corporate energy awareness program, with support of BC Hydro, to promote energy conservation measures with staff, which the City has entitled Because Energy Awareness Matters (BEAM). Under this program Year 1 of the BC Hydro Workplace Conservation Awareness (WCA) program was recently completed with lots of support from our designated energy champions and staff. Initiatives and strategies for Year 2 will be developed this fall to further build on the WCA program's initial successes.
- Pilot project to use light-emitting diode (LED) street lighting instead of metal halide lighting along Lansdowne Road between Hollybridge Way and Gilbert Road to compare the performance and maintenance requirement. As a result of the positive results to date, the use of LED street lights will be extended into the adjacent River Green development.
- The increased development of the district energy utility (DEU) portfolio has been fully endorsed by Council and construction of the first DEU in West Cambie (Alexandra District Energy Utility) is underway, with several others under feasibility review, and
- The completion of three LEED certifiable Gold buildings that included energy saving measures such as; geothermal heating, solar hot water system, green roofs, installation of high efficiency heat pumps and mechanical systems, and passive design aspects to increase daylight within the building (to reduce lighting) and to allow for natural ventilation. The three buildings that achieved this LEED standard are Steveston Fire Hall No.2, Hamilton Community Centre, and the RCMP Safety Building renovation.

More detailed accounts of EMP projects completed in 2010 and 2011 are provided in **Attachments 3 and 4.**

Future EMP Vision and Goals

Throughout the development of the City's Energy Management Program, the program has been extremely successful in implementing energy saving projects that have contributed to reduced corporate energy use, energy cost avoidance, and reduced GHG emissions. However, with the establishment of key strategies within the City's Sustainability Framework, which include not only the establishing and realizing of energy and GHG reduction targets, but also empowering the community and corporate organization, the City's program will need to be expanded to fully support the framework's objectives.

To allow for the EMP to develop further and to align it more closely with the Sustainability Framework (Sustainable Resource Use and Climate Prepared City), the following key energy

management strategies, in connection with the overriding Sustainability Framework strategies (**Attachment 1**), will be required;

- Increase energy use awareness within the organization and community
- Continue to seek out 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 EMP 2011/2012 workplan was developed in order to fulfill the strategies listed above, and to continue the positive and successful development the Energy Manager’s role. Key highlights of the workplan include the following action items to support the Sustainability Resource Use-Energy Smart City goal of the Corporate Sustainability Framework.

Sustainability Resource Use-Energy Smart City

Strategies	Empower	Reduce	Localize	Renew
Develop a pilot introduction presentation for City energy use stakeholders (community centres) and corporate partners (city departments), to better inform the organization about energy management best practices, our City energy use, and civic policies concerning energy and GHG emissions	✓			
Develop an energy reduction challenge pilot program to be run at our respective community centres, to encourage information sharing between the City and stakeholders, as well as promoting energy awareness	✓	✓		
Complete Year 2 of the workplace conservation awareness program	✓			
Facilitate partnership with the Richmond School Board to further build up energy awareness with students; investigate potential joint symposium with focus on youth	✓	✓	✓	
Continue to facilitate energy reduction projects through the BC Hydro Power Smart Program		✓		
Continue to seek out funding and support from Fortis BC, and the provincial and federal governments, for energy management projects and initiatives that are inline with City objectives		✓		
Initiate the BC Hydro Continuous Optimization program at four facilities ⁴ (mostly supported by BC Hydro), which will involve the upgrading of the electrical and gas meters to real-time monitoring enabled and the completion of a nine to twelve month study to determine energy use optimization measures – this program is expected to reduce electrical and gas use from between 5-20% at each of the facilities involved	✓	✓	✓	
Develop an energy auditing and study schedule and scope of work for City assets, most notably buildings, to be able to reliably and continually identify worthwhile (economically, environmentally, and socially) energy management projects, and independently evaluate projects after completion	✓	✓	✓	
Establish corporate energy and GHG emissions reduction targets for the City, to allow for benchmarks and goals to be set that will drive the Corporate Energy Management portfolio, and allow for energy use and GHG emission projections from new developments to be analyzed in the context of our overall reduction targets	✓	✓	✓	
Facilitate the acquiring of benchmarking energy use data from external local municipal sources for corporate facilities (based on size and usage), to be able to compare City facilities to similar regional examples and to be able to focus City of Richmond resources on under performing assets	✓	✓		

⁴ The four facilities to be included are Watermania, Richmond Ice Centre, City Hall, and the Main Library and Cultural Centre.

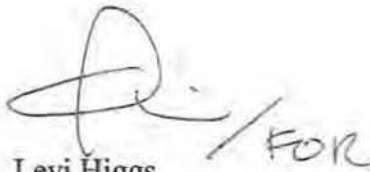
The funding strategy for these programs will be brought forward as part of the operating budget process for consideration by Council.

Financial Impact

There is no financial as a result of this report. Capital projects related to energy management and district energy are reviewed through the capital budget process.

Conclusion

The Energy Management Program has been successful in implementing corporate energy saving projects and has lead to new civic buildings constructed to high energy efficiency standards. Under Council's guidance, the City has consistently shown leadership in this area, which has enabled the City to leverage a considerable amount of external funding to support and develop its Energy Management Program (EMP). To further develop the EMP so that it aligns more closely with the adopted Sustainability Framework, the future vision of the EMP includes the empowering of the organization and community, with a focus on energy awareness knowledge programs, as well as the realizing of energy and GHG reduction targets though continued energy saving projects, such as retrofits.



Levi Higgs
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Attachment 1: City of Richmond's Corporate Sustainability Framework-Energy Strategic Program (REDMS 3372370)

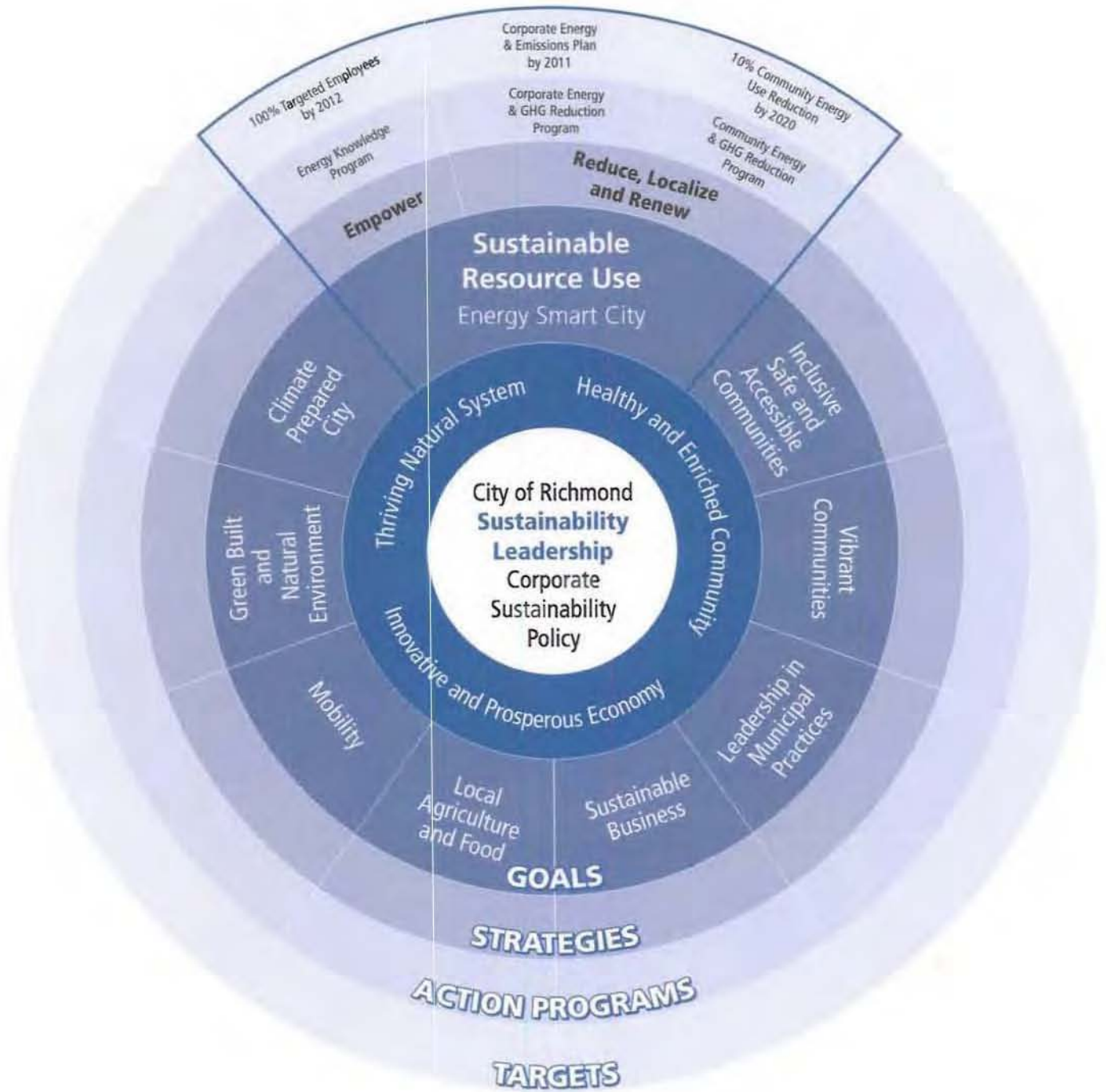
Attachment 2: Energy Report Summary – 2011 (REDMS 3375664)

Attachment 3: City Energy Management Program –2010/2011 Key Initiatives (REDMS 3367517)

Attachment 4: Summary of 2011 Energy Management Projects (REDMS 3367517)

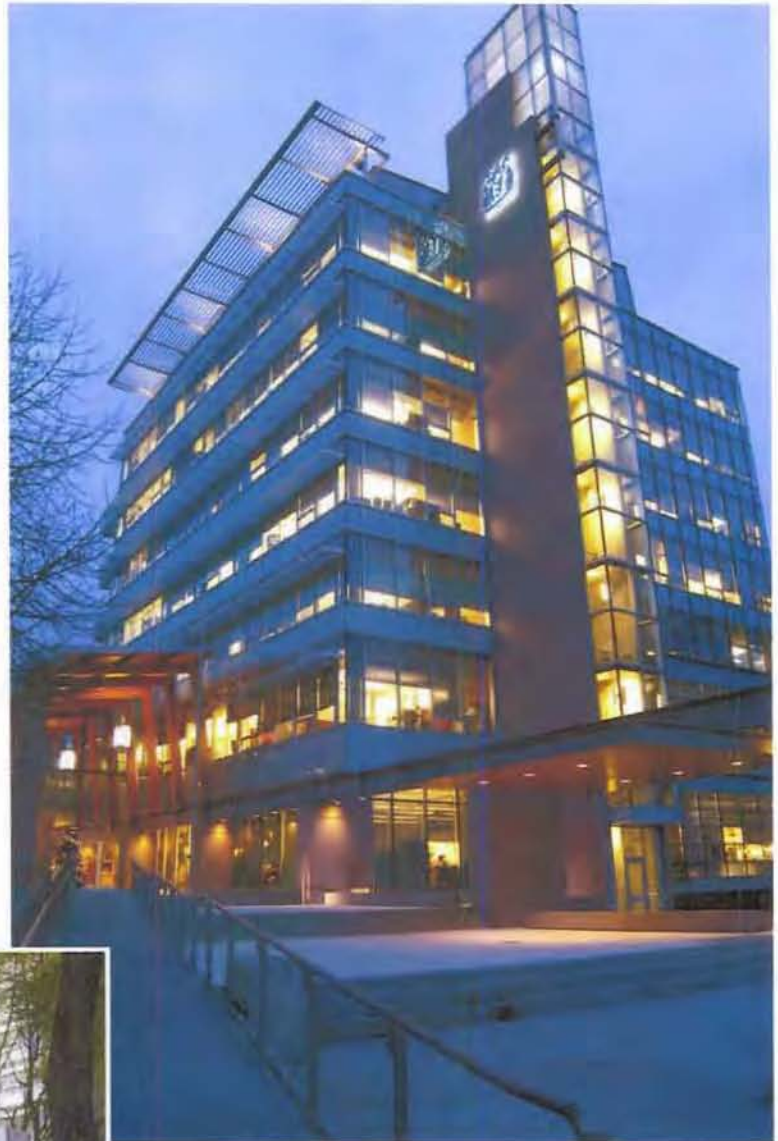
⁵ The four facilities to be included are Watermania, Richmond Ice Centre, City Hall, and the Main Library and Cultural Centre.

City of Richmond's Corporate Sustainability Framework – Energy Strategic Program –

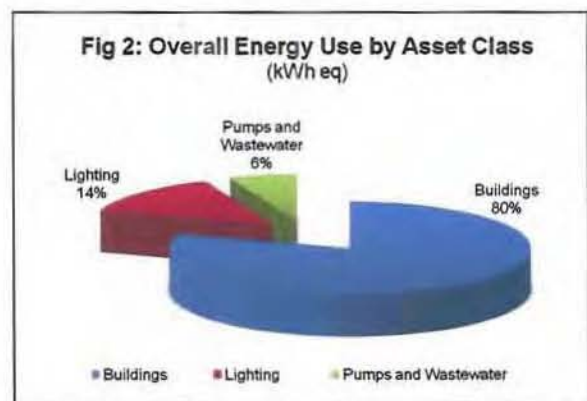
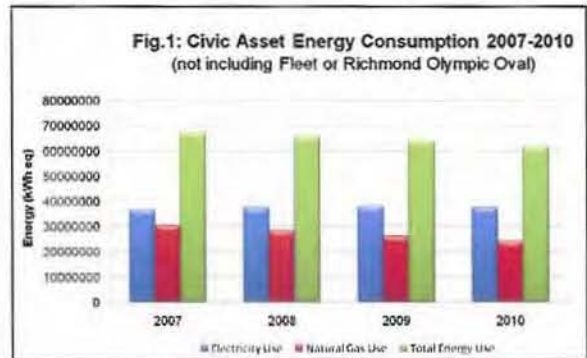


Energy Update Report

Summary 2010/2011



- Cost of energy in 2010 for the City of Richmond buildings (not including the Oval), lighting, pumps and wastewater systems = **\$4.4 million dollars or 61,573,000 kWh (electricity and natural gas).**
- As compared with 2009 energy consumption for these services decreased by approximately **2,611,000 kWh** or enough energy to power approximately 300 homes in the Lower Mainland.
- Energy use at civic buildings accounted for **approximately 80%** of the total 61,573,000 kWh used in 2010 (48,676,000 kWh), which consists of approximately 90 facilities.



- Of the 90 civic facilities under City stewardship, energy use in 2010 at only **11 facilities** accounted for over **80%** of the overall civic building energy use.
- Recreational pools and ice arenas were our highest energy consuming facilities - with **Watermania, Richmond Ice Centre, Minoru Pools and Minoru Arenas** accounted for 43% of the energy used by civic buildings in 2010.
- Given this large percentage of civic energy used by a small number of facilities, high priority should be placed on investment for energy management initiatives at these locations foremost.
- As well placing a high priority on efficient energy system design during the development phase of new facilities (specifically pools and ice arenas), will go a long way in ensuring that our corporate energy and GHG reduction targets can be met in the long term.



- Secured approximately **\$500,000** of external funding to support the Energy Management Program.
- To reduce our civic natural gas use, solar thermal hot water systems, to pre-heat water, were installed at Steveston Outdoor pool, South Arm Outdoor Pool, and Minoru Pool.
- Helped facilitate a ballast and lighting retrofit at the Richmond Olympic Oval, which is estimated to save approximately **500,000 kWh** of electrical energy per year.
- Developed a corporate energy awareness program, with support of BC Hydro, to promote energy conservation measures, which the City has entitled Because Energy Awareness Matters (BEAM).
- Under this program Year 1 of the BC Hydro Workplace Conservation Awareness (WCA) program was recently completed with lots of support from our designated energy champions and staff. The WCA program included initiatives such as a monitor shutdown challenge and a workspace tune-up tutorial.
- Initiatives and strategies for Year 2 will be developed this fall to further build on the WCA program's initial successes.



- Three LEED certifiable Gold buildings will have been opened in 2011 – Hamilton Community Centre, Steveston Fire Hall (No.2), and the new Safety building.
- Numerous energy saving measures were included in these projects, to reduce energy use and green house gas emissions.



- Energy saving measures at the new buildings included;
 - geothermal heating and cooling system at the Steveston Fire Hall – to reduce heating costs and natural gas use
 - solar hot water systems – to reduce domestic hot water heating costs and natural gas use
 - installation of high efficiency heat pumps and mechanical systems – to reduce heating and cooling costs and energy use
 - green living roofs – to reduce run off, urban heat island effect and heating and cooling costs
 - daylight harvesting where using skylights and large windows – to reduce lighting cost and electrical use
- These buildings continue the tradition of constructing “sustainable high performing buildings”, such as Sea Island and Hamilton Fire Halls, which were built to LEED Silver and Gold standards, respectively in 2007.



- Continue leadership role of the Municipality in regards to energy management best practices
- Align the Energy Management Program so it is more connected with the Sustainability Framework
- Empower the organization and community, with a focus on energy awareness knowledge programs

Action Items include:

- Develop and deliver an introduction presentation for City energy use stakeholders (i.e. community centres) and corporate partners (i.e. city departments), to inform and empower
- Develop and deliver an energy reduction challenge pilot program to run at our respective community centres, that rewards community centres for

energy reduction initiatives and awareness, and encourages information sharing between the City and stakeholders

- Continue to facilitate energy reduction projects through the BC Hydro Power Smart Program
- Real-time energy monitoring data collection - to reduce electrical and gas use from between 5-20% at each of the facilities involved
- Complete Year 2 of the workplace conservation awareness program
- Develop an energy auditing and study schedule and scope of work for City assets, to be able to reliably and continually identify worthwhile energy management projects, and independently evaluate projects after completion.
- Establish corporate energy and GHG emissions reduction targets for the City



City Energy Management Program –2010/2011 Key Initiatives

Management Areas	2010/2011 Key Initiatives
Plan	<p><i>Energy Strategic Planning:</i></p> <ul style="list-style-type: none"> • Secured over \$500,000 in external grant applications in 3 years to support energy initiatives efficiency initiatives such as <ul style="list-style-type: none"> ○ Solar thermal panel installations at Steveston and South Arm Outdoor Pool, and Minoru Pool ○ Funding in 2010 and partly in 2011 for Energy Managers and Energy Specialist positions ○ Lighting retrofit projects • Concluded RFEOI for external energy audit consultants to complete on-going assessments of building energy performance and energy saving projects – decision is pending for energy consultants to be selected and scheduling to be determined • Developing RFP to completed an evaluation of Richmond’s future corporate energy needs 2020 and beyond and to aid in the development of corporate energy and GHG reduction targets
Do	<p><i>Building Capacity</i></p> <ul style="list-style-type: none"> • Workplace conservation Awareness program Year 1 completed, Year 2 in planning stages. • Greater involvement and communication Energy Manager within different departments has been initiated, to ensure that energy management projects are conducted as efficiently and seamlessly as possible • Information sharing opportunities within the organization will be evaluated, including introduction presentation, to build corporate energy awareness <p><i>Reducing Energy Use</i></p> <ul style="list-style-type: none"> • Application of leading-edge technology energy efficiency and alternative energy initiatives <ul style="list-style-type: none"> ○ Steveston and South Arm Outdoor Pools, and Minoru Solar Thermal Panels – to pre-heat water ○ LED lighting technology for existing lighting upgrades, Watermania, Steveston Community Centre, and City Hall ○ Optimization of energy using systems at four key facilities, through the BC Hydro Continuous Optimization Program – with an aim to reduced energy use at each by 5-20%. <p><i>Increasing Financial Security & Stability</i></p> <ul style="list-style-type: none"> • over \$60,000 in avoided cost escalation through energy and maintenance savings (not including the Richmond Olympic Oval reduction – est. to be approximately \$75,000)
Monitor & Report	<p><i>Improving Energy Monitoring System</i></p> <ul style="list-style-type: none"> • Continue to improve and reconcile corporate-wide asset energy tracking inventory, which is web based • Upgrading of the energy monitoring capabilities at four facilities to real-time by the end of 2011 (City Hall, Watermania, Richmond Ice Centre, and Main Library/Cultural Centre) – in order to reduce usage. <p><i>Reporting Performance</i></p> <ul style="list-style-type: none"> • Annual Corporate-wide Energy update report to Council • In the process of developing monthly reporting system to stakeholders (i.e. community centres, recreation facilities, and fire halls)
Innovate & Improve	<p><i>Exploring New Approaches and Technologies</i></p> <ul style="list-style-type: none"> • The following projects and feasibility of further evaluation will be assessed in the coming months <ul style="list-style-type: none"> ○ Sewage heat recovery system at Gateway Theatre ○ Demo Wind and water Turbines ○ LED street and parking lot lighting <p><i>Energy Management System Evaluation</i></p> <ul style="list-style-type: none"> • Planning on participating in a energy management system assessment (third-party), through BC Hydro

Summary of 2011 Facilities Management Project Development Energy Management Projects

	Project location	Description	Project capital Cost	Estimated Annual Energy and Maintenance Cost Avoidance	Secured Incentive (paid or signed agreement in place)	Source of External Funding	Notes
Projects							
1	Minoru Aquatic Centre	Solar thermal panel installation	\$120,000	\$3,500	\$91,839	RInC	In Progress
2	Steveston Outdoor Pool	Solar thermal panel installation and boiler replacement	\$144,399	\$4,000	\$43,320	RInC	In Progress
3	South Arm Outdoor Pool	Solar thermal panel installation and boiler replacement	\$134,090	\$4,500	\$40,227	RInC	Completed
4	Steveston Community Centre	Lighting retrofit	\$23,377	\$5,000	\$10,062	RInC	Completed
5	Japanese Cultural Centre	Lighting retrofit	\$6,895	\$1,400	\$3,252	BC Hydro	Completed
6	Works Yard	Lighting retrofit	\$31,329	\$4,100	\$13,864	BC Hydro	Completed
7	Steveston Pool	Lighting retrofit	\$28,607	\$3,000	\$9,490	BC Hydro	Completed
8	Watermania	Lighting LED retrofit	\$49,697	\$10,000	\$21,686	BC Hydro	In Progress
9	Steveston Community Policing Building	Lighting retrofit	\$4,180	\$750	\$1,886	BC Hydro	Completed
10	Salmon Festival Building	Lighting retrofit	\$26,614	\$3,500	\$11,338	BC Hydro	Completed
11	City Hall	Lighting LED retrofit completion	\$31,560	\$11,000	\$15,780 ¹	BC Hydro	In Progress
12	Richmond Olympic Oval	Ballast replacement and increased lighting control	\$230,000	\$75,000	\$92,000 ¹	BC Hydro	In Progress
Total Projects			\$830,748	\$130,250	\$338,964²		

¹ Agreement for incentive yet to be signed, but discussions indicate that BC Hydro would fund approximately 40-50% of the project.

² Total secured funding does not include external funding received to support civic positions or funding received for completed studies

