



# City of Richmond

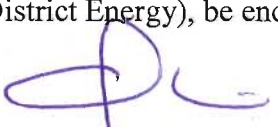
## Report to Committee

**To:** General Purposes Committee  
**From:** Cecilia Achiam, MCIP, BCSLA  
Interim Director, Sustainability and District  
Energy  
**Re:** Gateway Theatre Sewer Heat Recovery System




**Date:** August 15, 2012  
**File:** 10-6600-10-01/2012-  
Vol 01

### Staff Recommendation

That the incorporation of the Sewage SHARC wastewater heat recovery system into the existing building heating system at Gateway Theatre (as described in the report *Gateway Theatre Sewer Heat Recovery System* dated August 15, 2012 from the Interim Director, Sustainability and District Energy), be endorsed.

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

Att. 1

REPORT CONCURRENCE			
<b>ROUTED TO:</b>	<b>CONCURRENCE</b>	<b>CONCURRENCE OF GENERAL MANAGER</b>	
Arts, Culture & Heritage	<input checked="" type="checkbox"/>		
Budgets	<input checked="" type="checkbox"/>		
Engineering	<input checked="" type="checkbox"/>		
Law	<input checked="" type="checkbox"/>		
Project Development	<input checked="" type="checkbox"/>		
<b>REVIEWED BY SMT SUBCOMMITTEE</b>	<b>INITIALS:</b> 	<b>REVIEWED BY CAO</b>	<b>INITIALS:</b> 

## Staff Report

### Origin

On April 26, 2010, Council adopted the provincial greenhouse gas (GHG) reduction targets and approved an amendment to the Richmond Official Community Plan Bylaw 7100, which sets Richmond's community-wide GHG reduction targets at 33% below 2007 levels by 2020, and 80% below 2007 levels by 2050.

On July 14, 2010, Council adopted the Energy Sustainability Strategic Program with the target to reduce energy consumption in the Richmond community by at least 10% by 2020, from 2007 levels.

Goal # 8.1 in the Council Term Goals for the Term 2011-2014 states:

***“Sustainability – Continued implementation and significant progress towards achieving the City’s Sustainability Framework, and associated targets.”***

The proposed initiative in this report meets the intent of these Council directives.

### Background

In 2007, the Richmond community consumed close to 22 million GJ of energy. Buildings consumed 61% of this energy (See Figure 1).

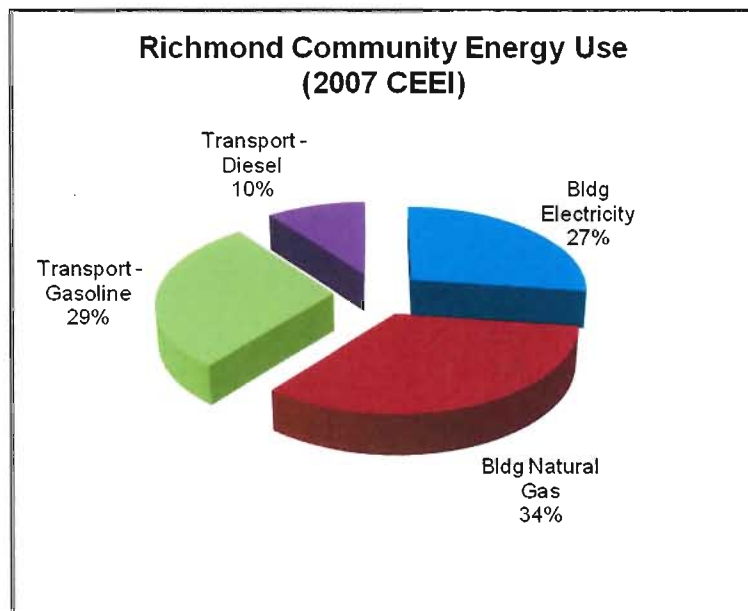


Figure 1

In 2010, the City, as a corporation, consumed approximately 270,000 GJ of energy to power buildings, fleet, lighting, and water/waste water services. Buildings consumed 66% of this energy (See Figure 2).

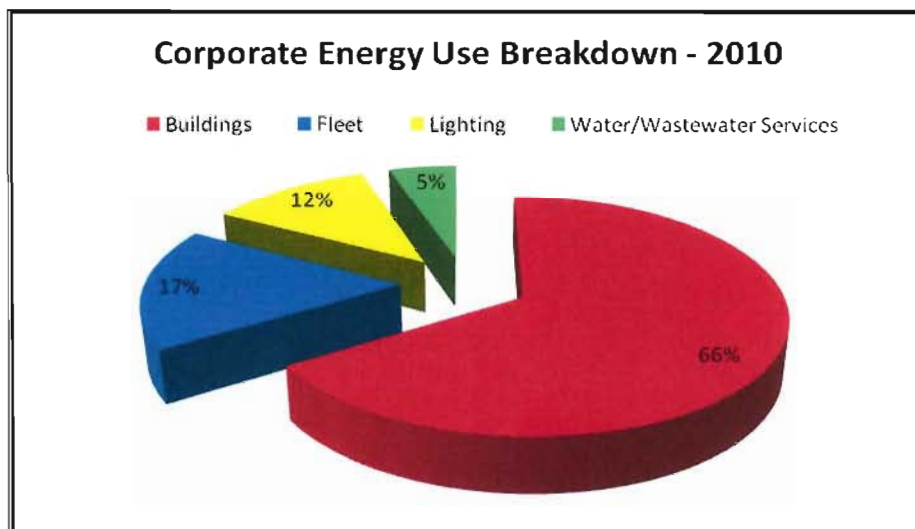


Figure 2

Even with a very successful corporate energy management program in place and active promotion of energy conservation and energy efficiency in new buildings, this level of consumption is anticipated to increase over time as the City develops more facilities and expands its services, and the community continues to expand.

Corporately, the City has already undertaken a wide range of projects to reduce the energy consumption and energy-related GHG emissions in the existing and future civic and community buildings. Highlight projects include:

- High Performance Building policy for civic buildings;
- LEED Silver Equivalent policy for new community buildings;
- Installation of solar thermal hot water systems at Steveston Outdoor Pool, South Arm Outdoor Pool, and Minoru Pool;
- Ballast and lighting retrofit, and lighting control retrofit at the Richmond Olympic Oval;
- Roof top heating and ventilation units replacement with high efficiency units at West Richmond Community Centre;
- Replacement of existing boilers with high efficiency boilers at both the Minoru Arenas and the Works Yard Administration building;
- Development of the district energy utility in West Cambie (Alexandra District Energy Utility).

As a result of Council's commitment to increased energy efficiency and the success of previous electricity efficiency initiatives, the City has been recognized by BC Hydro as a Power Smart Leader.

The continued reduction of electricity use is warranted and desired; however, it is important to recognize that for the City to achieve its ambitious GHG and energy reduction targets, it is necessary to continue exploring and implementing other energy saving measures beyond those encouraged by the BC Hydro Power Smart program. These measures include reducing consumption of natural gas, which is a much more significant GHG contributor than hydro electricity, and shifting towards alternative modes of energy production including solar, geothermal and other low GHG emitting alternatives.

## **Analysis**

Wastewater is a source of energy which can be used for heating and cooling buildings with heat pumps. The technology is simple and proven. The first installations were built more than 20 years ago. Over 500 wastewater heat pumps are in operation world-wide. Thermal ratings range from 10 kW to 20 MW. On account of the ideal source temperatures available (between 10°C and 25°C all year round), wastewater heat pumps achieve high coefficient of performance figures. In addition, such installations have an outstanding environmental performance.<sup>1</sup>

The City of Richmond's performing arts facility, Gateway Theatre (Gateway), is a two storey building, built around 1984, with a large theatre, a studio theatre room, offices, dressing rooms and a workshop. Space heating and makeup air heating for the building is provided by perimeter radiant heaters, heat pumps and an air handling unit supplying the stage area. All of these heating units are supplied with hot water from a natural gas fired boiler. It is estimated that Gateway uses on average a total of 2,614 GJ of natural gas annually for heating purposes.

An interdepartmental staff team that included members of Engineering & Public Works, as well as Project Development and Facility Services, have been working with International Wastewater Heat Exchange Systems Inc (IWHES) exploring the opportunity to integrate a wastewater heat recovery system into Gateway's heating system. Gateway was chosen due to the proximity of the wastewater pump station, the large estimated flows to support the wastewater heat recovery system, and the ease of incorporation into the heating system. In addition, some of the mechanical systems at Gateway are at the end of their life which enables the City to coordinate systems improvement at the same time. Any work performed will be closely coordinated with the Gateway Theatre staff to make sure it does not affect the theatre operation in any way.

IWHES is the distributor of the unique pre-engineered packaged wastewater heat recovery system called the Sewage SHARC system (SHARC). It features a self-contained clog proof filtering system, which eliminates potential odour issues and fouling of the heat exchanger due to the formation of a biofilm.

The SHARC is a version of a technology developed in China for heating and cooling buildings using raw wastewater. There are a number of installations throughout China, a few in North America, and one in a private development in North Vancouver. The Gateway installation will be the first application in Canada of this tried and tested system that will use raw wastewater from the municipal sewer pump station.

---

<sup>1</sup> "Sewage Water: Interesting Heat Source for Heat Pumps and Chillers", by Felix Schmid, Energy Engineer FH, SwissEnergy Agency for Infrastructure Plants

Thermal energy will be captured from the raw wastewater using the SHARC system. The heat exchanger will transfer the energy from the wastewater into Gateway's heat pump water loop. This heat pump water loop will be completely separate from the wastewater. The building's boiler will remain to assist in heating or to serve as a backup if required. **Attachment 1** shows how the wastewater heat recovery system will be connected to the existing heat pump loop.

The installation of the SHARC system will:

- Result in annual natural gas savings of between 930 GJ and 1,150 GJ, which represents an annual reduction of 36% to 44%;
- Significantly improve the energy performance at Gateway; and,
- Reduce corporate GHG emissions.

Staff have successfully negotiated a reduction in the capital cost for the supply and installation of the system, which includes a five year parts, maintenance and warranty program. This reduction in cost was achieved by allowing the supplier the opportunity to gather operational data and use this project for promotional purposes.

Once installed, the SHARC system will be used to showcase this type of technology for the community as an example of a viable, sustainable, and low GHG emissions energy source.

### Financial Impact

Council approved the funding for this project under Energy Management Retrofit Projects funding of \$740,000 in the 2011 Capital Budget. The supply and installation of the SHARC system will cost \$54,370. The payback period for the sewer heat recovery system is between 6-7 years. The City will continue to benefit from the lower energy cost after the Enterprise Fund has been paid back in full.

### Conclusion

The Sewage SHARC wastewater heat recovery system is a renewable energy technology that will reduce GHG emissions at Gateway Theatre between 36% and 44%.

This project will represent a significant step forward towards the implementation of Council adopted Energy Strategic Program strategies: *Reduce* energy consumption; *Use renewable* and clean energy sources; and *Increase self-reliance* to reduce costs and dependency on external systems. It will also demonstrate leadership by example in the community for transitioning towards a more sustainable and low GHG emissions energy use.



Alen Postolka, P.Eng., CEM, CP  
District Energy Manager  
(604-276-4283)

Att. 1	Schematic of Wastewater Heat Recovery System Integration	REDMS #3551997
--------	--	----------------

# Schematic of Wastewater Heat Recovery System Integration

