

## REPORT

### ***ENGINEERING SERVICES DEPARTMENT AND ELECTRICAL UTILITY***

To: Mayor W. Wright and Members of  
Council in Committee of the Whole

Date: November 4, 2013

From: Jim Lowrie,  
Director of Engineering

File: 09.1740.02

Rod Carle,  
General Manager, New Westminster  
Electrical Utility

Subject: Sapperton District Energy System - Preliminary Information

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#### **RECOMMENDATION**

*THAT Council receive this report on the opportunities for a potential district energy system for the Sapperton area for information.*

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#### **PURPOSE**

The purpose of this report is to present Council with preliminary information on a potential district energy system for the Sapperton area.

#### **SUMMARY**

Staff has undertaken preliminary analysis on a potential district energy system for the Sapperton area. The district energy system would help the City achieve its greenhouse gas emission targets, diversify the City's Electrical Utility's revenue source and support the redevelopment of Royal Columbia Hospital (RCH) by reducing energy costs to focus available funding on health care facilities while achieving its provincially mandated requirement to become carbon neutral in its operations. Staff are proposing to initiate a community consultation process to present preliminary project information and gather feedback on the various site and technology options.

## **BACKGROUND**

District energy is being investigated by the City as a means to reduce greenhouse gas (GHG) emissions, through the introduction of renewable sources of heating for buildings, and as a long-range investment in sustainable infrastructure.

District energy (“DE”) systems are an efficient and effective means of distributing heating (and/or cooling) energy to buildings within a specific service area. The systems allow renewable, clean sources of energy to be ‘plugged into’ a distribution system either immediately or over time as technical and economic factors become favourable. Similar to other types of long-term infrastructure, DE systems are designed to provide stable and reliable heating or cooling energy to customers at utility rates that are comparable to conventionally supplied energy (e.g. hydro or natural gas).

District energy systems are beneficial in that they:

- Reduce our reliance on fossil fuels for heating buildings;
- Achieve a significant reduction in GHG emissions, helping to achieve the targets and objectives expressed in our Official Community Plan, Community Energy and Emissions Plan, and *Envision 2032* Sustainability Framework;
- Provide an opportunity for the City’s Electrical Utility to diversify its energy services while providing a modest source of revenue over the long term;
- Deliver a more even, comfortable heat to residential units by using space heating as opposed to electric baseboards; and
- Improve community energy resilience by moving towards renewable energy sources that will remain low cost over time in a period where traditional sources such as electricity and natural gas are expected to become increasingly expensive.

## **EXISTING POLICY/PRACTICE**

Identifying viable district energy opportunities and establishing a supportive policy and regulatory framework is strongly supported by the City’s *Envision 2032* sustainability framework and is one of the top implementation priorities from New Westminster’s Community Energy and Emissions Plan (CEEP). Council policy and recommendations from the Electric Utility Commission Strategic Plan have also supported this direction. This has resulted in a series of preliminary studies that have examined the technical and

financial viability of a future district energy system serving the Royal Columbian Hospital and future residential and commercial development in the Sapperton area.

### ANALYSIS

A District Energy System (DES) combines renewable heat generation using sewer heat recovery or thermal energy from wood chips, natural gas peaking boilers, and distribution systems (i.e., pipes for hot water) that bring the heat to buildings within a service area. In general, DE Systems can provide this heat energy more efficiently and at a lower cost than individual building heating systems. DE systems also have the advantage of being able to use renewable energy sources that help reduce environmental impacts and protect system users from significant price increases that are anticipated in the future with electricity and fossil fuels, such as natural gas.

It is important to note that the DE systems being discussed are not Waste-to-Energy (WTE) systems. WTE systems are large plants that produce heat and/or electricity from combusting household and commercial garbage (i.e., items that are not recycled, composted or reused). The proposed Sapperton District Energy System would use one of two renewable energy sources for the generation of heat: sewer heat recovery (heat pumps) or wood chip heating using clean waste wood shavings.

The area being proposed for the DE system is in the Sapperton neighbourhood. The core service area would include:

- Royal Columbian Hospital;
- Sapperton Green (Braid Station Area); and

With potential connection to:

- The Brewery District;
- New and existing apartment buildings along East Columbia Street buildings that use hot water heating.



Initially, RCH would form the base of the system's heating load with new buildings at Sapperton Green connected to the system as they are developed over time. These heating loads are being used in the analysis of the economic viability of the system.

Sapperton neighbourhood is being considered because the scale and timing of upcoming projects presents an opportunity for a district energy system in the area. Fraser Health Authority's expansion and redevelopment of the Royal Columbian Hospital, the 'Sapperton Green' large mixed-use development surrounding Braid Skytrain Station, the potential connection of the remaining buildings in the Brewery District, and the expansion of Metro Vancouver's sewer pump station in the Braid Industrial Area all contribute to making a district energy system viable.

*Royal Columbian Hospital*

The expansion and renovation of Royal Columbian Hospital represents a large customer and energy load for a DE system in the Sapperton area. The hospital has a very large heating requirement which would be a sufficient guaranteed heating load to justify the initial capital investment in a DE system.

The hospital expansion planning is currently underway and includes a new acute care tower, mental health building and energy centre. Existing buildings will be renovated and a replacement of the existing steam heating system to accommodate a new hot water system will also occur. Fraser Health Authority is interested in a district energy system as long as the utility rate charged to Royal Columbia Hospital does not exceed their "business-as-usual" energy costs. In addition, as the hospital is a provincial agency, it is required to pay both BC's carbon tax and "carbon offsets" for the natural gas they using in their heating plant. This requirement makes the cost of using natural gas more expensive for the hospital but potentially makes renewable heating sources, which don't incur the carbon tax or offsets, economically attractive.

In other words, the DE system is an attractive option to RCH, provided it saves money and helps reduce GHG emissions.

**Technologies under consideration**

Two renewable energy sources are being studied for a Sapperton DE system:

**Sewer Heat Recovery**

Sewage effluent contains a large amount of thermal energy that can be captured through a “heat pump,” similar to how heat is taken from the inside of a refrigerator, leaving it cooler, and expelling the heat out the back using fans. While heat exchangers require electricity for pumps, they produce no greenhouse gases.



*Vancouver’s False Creek Sewer Heat Recovery*

Metro Vancouver’s main sewer line serving the Northeast Sector (Coquitlam, Port Coquitlam and Port Moody) passes next to the hospital and the nearby Sapperton Pump Station pumps the sewer effluent to Annacis Island for treatment. This facility will be replaced shortly. Equipment for sewer flow diversion and screening could be included in the redesigned pump station.

**Wood Chip Heating**

Clean wood residue from construction or forestry is used a fuel in high efficiency boilers to produce hot water heating for the system. These boilers have “scrubbers” and other devices attached to the exhaust system to remove particulate emissions and would meet Metro Vancouver’s emission requirements. Current systems, such as the facility that supplies a portion of UBC campus heating needs, have been shown to create negligible air quality impacts. A system large enough to serve the Sapperton area would require two about truck loads of wood chips during peak heating season, far fewer in the summer. There is currently a



*UBC Nexterra Bioenergy Research Facility (district heating plant using clean, chipped wood for fuel)*

major producer of this fuel source located nearby in the Braid Industrial Area. While the combustion of wood does produce greenhouse gases, this technology is considered to be “carbon neutral” in the long run, i.e., no net production of GHGs, due to the fact that

when trees grow to maturity, they absorb an amount of CO<sub>2</sub> equal to the amount that they release at the end of their life during decomposition or burning.

Two sites are currently being considered for the Energy Centre that would house the main heat generation facility for the system:

**RCH parking lot at corner of Keary Street and Brunette Avenue.** This site will be redeveloped as part of the hospital redevelopment plan. It is located in close proximity to Metro's main Sapperton sewer line. The hospital's heating plant would occupy a portion of this site and could accommodate a sewage heat recovery system. This site is not large enough for a wood chip heating plant.

**City Owned Property in Braid Industrial Area - 435 Canfor Avenue.** The City owns two acres of land on Canfor Avenue near Braid Street. The site is located on Metro's main Sapperton sewer line and is large enough to accommodate either a sewer heat recovery facility or wood chip heating plant.

Three options are currently being considered:

**Option 1 - Sewer Heat Recovery on the RCH site.** Capital costs for this option are currently being explored and compared with "business-as-usual" heating using 100% natural gas. This would be a combined facility that houses an on-site sewage heat recovery system and peak heating natural gas boilers.

**Option 2 - Sewer Heat Recovery on the City site in the Braid Industrial Area at 435 Canfor Avenue.** Although the technology is the same as Option 1, additional capital would be required as costs for distribution piping connecting the City site with RCH would be much higher than Option 1.

**Option 3 - Wood Chip Combustion on the City site in the Braid Industrial Area at 435 Canfor Avenue.** Although the additional piping costs for this site would be the same as Option 2, the capital cost for high efficiency boilers using chipped wood for fuel is less expensive than sewage heat pumps. This option is expected to be within 10% of the hospital's base case heating costs.

The total estimated costs for the district energy system over a 30-year period is between \$40 million and \$50 million. This cost is higher than the business-as-usual (i.e., natural gas and electricity), but over the 30-year service life for the system, fuel costs for electricity and natural gas are forecast to be higher than the renewable energy options being considered. The cost estimate for sewer heat recovery on the RCH site are still

being calculated but, as the land and piping costs would be very low, the cost would be approximately \$7.5 million less.

### **NEXT STEPS**

#### ***Community Consultation***

Staff has prepared preliminary investigation of technical and financial aspects of a district energy system serving the Sapperton area. While staff complete technical analysis, an important concurrent step is to commence with a public consultation process. To initiate the public dialog, the following consultation program is proposed, with dates to be confirmed with respective stakeholder groups:

1. Public Open House – Sapperton Pensioners Hall (November, 2013);
2. Presentations to Community Organizations - McBride Sapperton Residents Association (November, 2013), Sapperton Business Association/Braid Business Association (November 2013);
3. Presentations to City Committees – Environment Advisory Committee (November 13, 2013), Economic Development Advisory Committee (November 29, 2013);
4. Print and social media notices; and
5. Information on the City’s webpage.

Staff anticipates providing Council with a report that outlines the results of the technical and financial analysis and the community consultation process in early December 2013. A second Open House is proposed for January 2014, where questions and concerns that were raised in the first Open House would be answered and recommended district energy system would be presented.

#### ***Technical & Financial Analysis***

The following activities need to be completed over the next two months as part of the City’s due diligence:

1. **Technical and Financial Analysis.** The City and consultants will complete a summary of this analysis and provide it to Council for their review.
2. **Air Quality and Monitoring Study.** Conduct additional studies and create plan as part of Metro Vancouver’s air quality requirements. This study is not required for the sewer heat recovery option.

3. **Community and Stakeholder Consultation.** The community and stakeholder consultation process described above would commence.
4. **Governance and Financial Model.** A workshop will be held with Council to present and discuss alternatives models.
5. **Discussions with Metro Vancouver to confirm any costs for the heat provided from their sewer system.** Metro's current interim policy is to provide the heat content of sewer effluent free of charge if this does not impact their cost of treating the sewer effluent downstream at Annacis Island facility.
6. **Preparation of Formal Proposal on DE Services to FHA.** After considering community feedback, FHA comments on the City's initial submission and results of the governance and financial model workshop, a business plan will be prepared for consideration by City Council and the Electric Utility Commission. If the business plan is approved, a proposal for the provision of DE services would be submitted to FHA in early 2014.

### **OPTIONS**

Two options are presented for Council's consideration. They are:

1. That Council receive this report on the opportunities of a potential district energy system for the Sapperton area for information; or
2. That Council provide staff with alternate direction.

Staff recommends Option 1.

### **INTERDEPARTMENTAL LIAISON**

Working on the feasibility of a district energy system requires an integrated approach. Staff from City's Electrical Utility, Development Services, Engineering, Finance, Communications and the Chief Administrator's Office have been involved in assessing the technical and economic feasibility and policy aspects of a potential neighbourhood energy system serving the Sapperton area.

### **CONCLUSION**

The City of New Westminster is considering a district energy system for the Sapperton area. District energy provides the opportunity for long-term, low-cost renewable energy

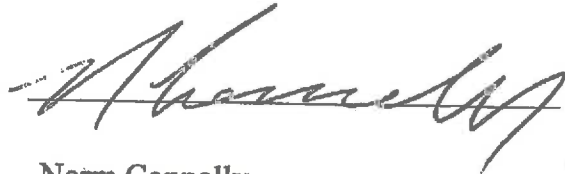


that supports energy security and the achievement of Greenhouse Gas reduction targets. Two types of technologies are being considered, sewer heat recovery and wood chip combustion. Two sites are being evaluated, within the Royal Columbian Hospital campus and at a city-owned site at 435 Canfor Avenue. Staff are proposing to start a community consultation process to present the preliminary information and gather feedback from area residents, business and other stakeholders. Staff will report back to Council once additional analysis has been completed with recommendations on next steps in the process.

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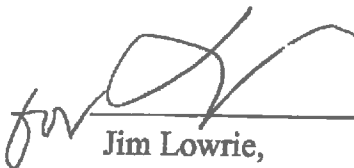


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