



City of Richmond

Report to Committee

To: Public Works and Transportation Committee

Date: October 8, 2009

From: John Irving, P.Eng. MPA
Director, Engineering

File:

Re: District Energy Utilities

Staff Recommendation

That:

1. staff be directed to issue requests for expressions of interest to provide implementation and operational support of District Energy Utilities in partnership with the City, Developers, and other agencies on the basis of the following guiding principles:
 - a) the District Energy Utility should be wholly owned by the City.
 - b) district Energy Utility costs to end users should be equal to or less than conventional energy costs for the same level of service over the same annual period.
2. the intent to provide City funding to cost share the development of District Energy Utilities be endorsed for the purposes of seeking grant funding.

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

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ROUTED TO:	CONCURRENCE		CONCURRENCE OF GENERAL MANAGER		
Economic Development	Y	<input checked="" type="checkbox"/>	N	<input type="checkbox"/>	
Facility Management	Y	<input checked="" type="checkbox"/>	N	<input type="checkbox"/>	
Development Applications	Y	<input checked="" type="checkbox"/>	N	<input type="checkbox"/>	
Sustainability Unit	Y	<input checked="" type="checkbox"/>	N	<input type="checkbox"/>	
Budgets	Y	<input checked="" type="checkbox"/>	N	<input type="checkbox"/>	
REVIEWED BY TAG	YES	NO			
	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
			REVIEWED BY CAO	YES	NO
				<input checked="" type="checkbox"/>	<input type="checkbox"/>

Staff Report

Origin

In 2007, sustainability was advanced as a corporate priority and Council adopted an Enhanced Corporate Sustainability Initiative. By taking action on sustainability corporately, the City is seeking to achieve the its vision “to be the most appealing, livable and well-managed community in Canada” and to specifically do this through:

- **Leadership** – becoming a municipal leader in sustainability through pursuing and integrating social, economic and environmental goals over the long-term;
- **Learning and Innovation** – promoting new ways of thinking and taking action by staff including Triple Bottom Line assessment and ongoing exploration of new and emerging green technologies;
- **Coordinated planning and action** – taking a coordinated approach to integrating sustainability across City departments; and
- **Partnerships** – over time, encouraging the participation of the community, business and other sectors in creating a more sustainable community.

Council Term Goal #7 reads as follows:

“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 includes: ...Exploration of an alternate district energy utility...”

District Energy Utility (DEU) concepts and opportunities have been explored and developed by staff in direct support of the Sustainability Initiative objectives and Council Term Goal #7. The purpose of this report is to update Council on DEU initiatives and seek direction on next steps.

Analysis

District Energy Defined

A District Energy Utility (DEU, sometimes referred to as a District Energy System or Neighbourhood Energy Utility) is a system that centralizes the production of heating and/or cooling for a neighbourhood or community. DEU’s are not new. District steam heating plants in North America go back over a century, and Central Heat Distribution Ltd. has been providing heat to the Vancouver downtown core since the 1960’s using a central natural gas boiler plant.

DEU’s are proliferating in BC as they represent one of the potential solutions to our energy and emissions challenges. In addition to Central Heat Distribution Ltd., the Lonsdale Energy Corporation was established by the City of North Vancouver in 2004 and new DEU’s have been

established at Southeast False Creek, Revelstoke, Kamloops and Dockside Green in Victoria. Most large development projects in the province are either considering or are committed to using a DEU.

Some of the key benefits of a DEU are as follows:

- Replaces the need for individual buildings to have their own boilers or furnaces, chillers or air conditioners, resulting in capital cost and maintenance cost savings.
- DEU's have the potential to reduce the size of heating and cooling infrastructure, reduce emissions, and hence reduce costs.
- Can use renewable sources such as biomass, geothermal, and combined heat and power generation.
- Can capture and use waste heat from industrial, commercial and institutional use (i.e. ice surfaces, wastewater treatment plants).
- Technology is proven, most DEU's operate with a reliability rate of 99.999 percent.
- Reductions in GHG emissions will reduce the pay out to the Province from 2012 onwards.

In what is a common misconception, many DEU's come to be identified by the energy source they are hooked up to, such as geothermal, biomass, or solar. However the most critical elements of a DEU are the user base and the distribution network, and when establishing the partnerships and legal framework of a DEU the primary focus should be on these elements. The specific system or technology that is used to generate the heat is secondary, as this can be altered or switched out over the life of the DEU depending on the best available technology and/or fuel sources at the time.

DEU Models

Three basic models that can be considered for establishment and operation of a DEU; Municipal Owner-Operator, Private Sector Owner-Operator, and Public Private Partnership (P3).

Municipal Owner-Operator

In this model the municipality owns, designs, builds and operates the DEU. This would be similar to the City's Water Utility. Various design, build and operating tasks may be contracted to the private sector, in the same way that water capital projects and the City's water meter program are run. The City would retain full ownership of the system and direct operational control.

The critical challenge with this option is that the City has no expertise or experience in building and operating a DEU. Building this capacity could be accomplished over time, but would be difficult to achieve within the critical timelines of current opportunities.

Private Sector Owner Operator

In this model a private sector company would own, design, build and operate the DEU. The City would have some regulatory control of distribution networks in City ROW's in the same way that gas, electrical and telecommunication systems operate.

The challenge for the private sector to establish a DEU on it's own is that there is significant up front capital cost and limited opportunity to develop a strong customer base in the near to medium term. When servicing multiple properties, a private owner would also be regulated under the BC Utilities Commission and therefore have limited flexibility on rate structures.

In contrast to the telecommunications industry, the fact that the private sector has not developed significant off-site DEU's in the last few decades is evidence of the challenges faced.

Public Private Partnership, P3

In the P3 model, the City would own the DEU while private sector partners would develop the user base and design, build and operate the system. Establishment of a DEU is a natural fit for P3 as each partner has significant value to contribute to the project.

Municipalities operating a public utility within their boundaries are exempt from regulation by the BC Utilities Commission. Therefore as owner, the City would be in full control of the rate structure and service delivery for the DEU. This is a significant advantage that private sector partners cannot offer.

Private sector utility companies such as Corix and Terasen have experience and knowledge in DEU construction and operation and can provide significant value to a P3 by bringing this to the table. Finally, development companies have the expertise to build and bring to market the developments that would form the user base for a DEU.

At this high level scan, the P3 model appears to be the preferable one for establishing DEU's, however the site conditions would be fully analysed to determine the best governance and ownership model for any specific opportunity.

Sustainability

Staff are currently moving forward on numerous sustainability initiatives, lead through the City's newly created Sustainability Unit. Building on the success of the Energy Management Program, the Sustainability Unit will be developing a Community Energy Plan and greenhouse gas reduction strategy. The Plan will include a community wide assessment of DEU potential and map out existing waste heat supply sources and concentrations of demand and define the City's guiding policies on DEU's.

In the context of these long-range planning efforts, numerous opportunities for DEU's are emerging that require action in the short term.

Current DEU Opportunities

Residential units are one of the prime energy consumers in the community. Many existing residential buildings use electric heating systems and the cost of retrofitting these to use hot water heating systems compatible with a DEU can be very high. Installing the necessary DEU piping networks in a previously developed road is also more costly than installing the system simultaneously with new development. Designing new buildings to be serviced from a DEU also eliminates the need for on-site boilers and heat generation equipment, thereby reducing construction costs and freeing up valuable square footage. Each development that moves forward using conventional heat and hot water systems is not only a missed opportunity but also a new barrier to future DES growth. Large developments are attractive as DEU's have significant economies of scale, and become much easier to operate with larger and more consistent demand loads.

Given the above, the best opportunities for cost effectively establishing a DEU typically occur with new large residential developments. Staff identify new development proposals in the approval process and discuss DEU opportunities with developers. When a developer is interested in the DEU opportunity, a memorandum of understanding is established that defines the scope of the project under consideration and initiates feasibility study work. Feasibility studies include a scan of all potential DEU users in a given area, including industrial and commercial developments. Upon completion of a favourable feasibility study there may be further refinement of specific scope or phasing options. The next critical step would then be to engage a third partner with DEU design, construction and operation expertise. Given the complexities of starting up a DEU from scratch and the importance of site specific conditions, the best process for engaging the third partner would be through a Request for Expressions of Interest (REOI).

When a preferred proponent is identified through the REOI process, then a legal agreement would be negotiated between the partners to establish the terms, responsibilities and funding for constructing and operating the DEU. Council direction would then be sought on the execution of any legal agreement.

DEU opportunities are being actively explored and advanced for the following developments:

- **River Green** (ASPAC) – First MOU signed in 2008. Preliminary feasibility completed in the spring, 2009, second MOU currently being developed for Phase 1 implementation.
- **West Cambie** (Oris) – First MOU under development.
- **River Rd** (Oris) - First MOU under development.
- **Fantasy Gardens Site** (Townline) – First MOU under development.

Staff will shortly be ready to issue an REOI for the River Green development. The DEU concept for this project includes the capture of waste heat from the Richmond Olympic Oval. This touches into the other area of significant opportunity for establishing DEU's, which is existing waste heat sources.

The Sustainability Unit will be assessing waste heat sources in the City as part of the Community Energy Plan development. Many industrial and commercial activities generate waste heat that can be captured by a DES and distributed to meet heating demand. Inversely, other industrial and commercial activities are large energy consumers and can potentially provide a strong user base to support a DEU.

Sewage has a high temperature relative to ambient ground temperature and is a very large potential source of energy. In consultation with City staff, Metro Vancouver has initiated a study of Lulu Island Wastewater Treatment Plant and the surrounding area to determine the feasibility of capturing waste heat from the treatment plant outfall and distributing it to meet demand in the area.

Over the long term, DEU nodes can be expanded and eventually linked to each other, until large portions of the City are serviced by a single interconnected DEU. In growing to this stage the DEU becomes a mature utility and can be operated and regulated in much the same way as the City's water and sanitary utilities, with mandatory hook-up and development contribution.

Financial Impact

There is no financial impact at this time. Current feasibility work on each development opportunity is being funded from the Energy Management Program with support from partners such as BC Hydro.

As with the City's existing water and sanitary utilities, the long-term financial model for any DEU would be that the utility is 100% funded from user fees. There are significant up-front capital costs that would need to be funded from other sources initially and paid back over the long term through the user fee structure.

The experience of existing DEU's and the feasibility work completed to date warrant a high level of confidence that DEU's can be developed and operated over the long term for less cost and with lower GHG emissions than conventional energy systems. Specific costs are highly dependent on site conditions, technology selection, project scope and implementation phasing.

For DEU opportunities explored to date, first phase implementation costs would be in the order of seven figures, but likely well under \$10 million. Specific costs and funding recommendations on any given opportunity would be identified at the legal agreement stage.

Previously established DES's in BC have been successful in securing grant funding and there are numerous existing grant programs that could be applied to for financial support, including Build Canada, P3 Canada and the Clean Energy Fund.

The \$1.2 billion P3 Canada Fund (P3CF) will support 25% of a project's direct construction costs. The P3CF round one preliminary submission deadline is Oct. 30, 2009. For the purposes of supporting a City submission on one or more of the DEU opportunities presented, it is recommended that the intent to provide City funding to cost share the development of District Energy Utilities be endorsed.

Conclusion

District Energy Utilities are proven to provide significant cost and environmental benefits in the delivery of heat, hot water, and cooling to the built community. Significant opportunities currently exist in the City for the development of DEU's.

To take advantage of these opportunities it is recommended that:

1. staff be directed to issue requests for expressions of interest to provide implementation and operational support of District Energy Utilities in partnership with the City, Developers, and other agencies on the basis of the following guiding principles:
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