

Staff Report



Development Services Department

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REPORT TO: Climate Change and Environment Committee

DATE OF MEETING: October 17, 2024

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WARD(S) INVOLVED: Ward(s) 9 and 10

DATE OF REPORT: October 4, 2024

REPORT NO.: DSD-2024-424

SUBJECT: Downtown District Energy Technical and Financial Feasibility Study

RECOMMENDATION:

That the Climate Change and Environment Committee supports the City continuing to advance district energy in Downtown Kitchener.

REPORT HIGHLIGHTS:

- The purpose of this report is to inform the Committee of progress of the downtown district energy project and to seek the committee's support in continuing this work.
- The key finding is that there is a promising opportunity for the City to pursue a low carbon district energy project downtown. Three scenarios were modeled and the recommend option focuses on the Bramm Works yard redevelopment and three adjacent private developments. Most of the required energy would come from open-loop geo-exchange technology. The study finds annual GHG savings of 3,000 tones per year alongside positive financial returns supported by economic and resiliency benefits. Staff are recommending continued work on the district energy project based on these findings.
- Community engagement was undertaken with developer and municipal interest holders.
- This report supports Cultivating a Green City Together: Focuses a sustainable path to a greener, healthier city; enhancing & protecting parks & natural environment while transitioning to a low-carbon future; supporting businesses & residents to make climate-positive choices.

BACKGROUND:

District Energy (DE) involves heat and cold generated at a centralized plant that is circulated to customers through piped hot and cold water distribution networks. District energy systems (DES) exist in many large to mid-size Ontario municipalities including Windsor, London, Hamilton, Markham, Ottawa, Sudbury, and Toronto. It provides a flexible, future-ready, local thermal energy grid that enables the phased introduction of clean energy solutions that are not available to individual building-level HVAC systems. A DES contains three key components: 1) an energy centre (EC) where energy is centrally generated; 2) the distribution piping system (DPS) that connects the EC to customers and is usually run under road rights-of-way; and 3) energy transfer stations (ETS), where heat is transferred to customer buildings.

*** This information is available in accessible formats upon request. ***
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Ground source heat pumps, also called geothermal or geo-exchange, use electricity (from the Province's low-carbon electrical grid) and consistent ground temperatures to efficiently harness thermal energy to heat and cool buildings. When paired with a DES, it produces far fewer Greenhouse Gases (GHGs) than conventional HVAC systems. Downtown Kitchener sits atop remarkably suitable hydrogeological conditions to leverage open loop geo-exchange technology.

In 2020, WR Community Energy led the development of a pre-feasibility study of a Downtown DES that identified an estimated total required capital investment of \$47M, with \$20M estimated for the first phase. It demonstrated the opportunity for a transformative climate and energy initiative with a positive internal rate of return over 25 years, as well as environmental, economic, and resiliency benefits. Staff identified the City as a potential leader in the development of a new DE utility that would leverage the strengths of Kitchener Utilities, and the organization at large, to provide a pathway to decarbonization, and mitigate risk in the natural gas sector. Through report DSD-20-151, Council directed staff to further develop a business case for the Downtown DES.

In 2022, the City retained FVB Energy and Salas O'Brien (authors of the prefeasibility study) to advance a more detailed technical and financial feasibility study (Attachment A). The size of a potential DE system in downtown Kitchener was larger through this work as compared to the prefeasibility study, resulting in a more significant capital investment with phased implementation to address the timing of customer connections. The study showed positive rates of returns.

Staff Presented this work to CCEC on April 20, 2023 and the committee resolved:

"That the Climate Change and Environment Committee supports continued development of the downtown district energy system business case including the exploration of partnership opportunities for its funding, delivery and operations."

In October 2023, council resolved the following:

"That the General Manager of Development Services and/or Infrastructure Services be authorized to execute the necessary grant applications, procurement, and funding agreements pertaining to the Environmental Sustainability Initiative in accordance with direction given in camera on October 30, 2023, and said documentation to be to the satisfaction of the City Solicitor."

REPORT:

Building on the 2023 report, FVB was retained in 2024 to further scope the district energy concept with the objectives of:

- Reducing the initial capital cost;
- Reducing customer non-connection risk by focusing on public lands;
- Tightening the geographic scope; and
- Maintaining opportunities for system growth beyond the initial phases.

Three options for DES concepts were evaluated.

All three options include a centralized energy centre at the Bramm works yard and use an open loop geo-exchange system to provide the majority of heating and cooling. Electric boilers, natural gas boilers and chillers with cooling towers would address peak needs on the hottest and coldest days.

- Option 1 – Focus on Bramm Yards and Ontario Seed site redevelopment
- Option 2 – In addition to the customers in Option 1, Option 2 includes customers in downtown extending as far as Ontario Street Including City Hall, former Charles Street Terminal, 25 Water

Street (Manulife), 417 King St W (Ziggy's), Kitchner Central Transit Hub, and private development near the corner of King and Victoria Streets (200, 130 and 146 Victoria St S).

- Option 3 – Connects Bramm and three private developments at 200, 130 and 146 Victoria Street South.

Integrating District Energy into the Bramm Works Yard Redevelopment

The City is planning for the redevelopment of the former Bramm works yard site. The council-approved vision includes an urban business park, affordable housing and sustainable building practices. Both the Bramm and private market developers are challenged by current market conditions making the timing of their projects uncertain. As redevelopment of Bramm is key to delivery of DE, because it contains the energy center, and redevelopment timing is uncertain, it is challenging to get customer commitments. An option to construct a temporary energy center, built in a shipping container, was assessed and found to be feasible. A temporary energy centre has the advantage that it avoids prematurely establishing a permanent standalone energy centre on Bramm that could encumber the ultimate redevelopment of the site. A permanent replacement energy center would be established on site as part of the Bramm redevelopment.

Benefits of District Energy

Environmental

The Study shows that GHGs would be reduced by 67 percent (3,060 tonnes/year), compared to business as usual under option 3. This is the equivalent of taking 937 vehicles off the road. As the district energy system grows, it enables additional customers, more renewables, thermal storage and waste heat recovery to advance climate objectives. Furthermore, district energy systems can be used to melt snow on nearby roads, sidewalks and trails. This can reduce salt application, improve water quality and provide active transportation benefits. As compared to site level solutions, a centralized approach to open loop geothermal is expected to be less risky to the drinking water aquifer and be more energy efficient.

Economic Development

District energy brings the potential for broad and important economic development benefits including:

- Less upfront HVAC cost and ongoing liability for building owners and operators
- Eliminating on site HVAC equipment frees up building space for other uses such as more homes, rooftop patios and rooftop amenity area
- Provides a plug and play solution to complying with coming green building mandates
- The city cannot compel DE connection, but it will be a compelling sustainable option in the marketplace for heating and cooling solutions
- Local construction and operational jobs
- Keeps more energy dollars local – The CEIS found that \$1.8B energy dollars leave the region every year
- Tailored heating and cooling solutions such as server cooling for tech firms or heating for med-tech sectors can help attract these firms to collocate near DE systems

Adaptation and Resilience

- System uptime and avoided interruptions - District energy systems are extremely reliable and can continue to provide service during electrical or gas system outages. Markham's DES has had less than 3 hours of downtime in its 22 years.

- District energy enables fuel switching (e.g. from natural gas to renewables) in response to dynamic environmental or financial imperatives in a way that is very challenging for building level systems.
- Prepares for the uncertain future of natural gas, changing coming legislation and High Performance Development Standards aimed at lowering the carbon emissions from buildings.

Recommended Option

Of the three options considered, option 3 maximizes customer loads relative to the length of distribution piping. It has the best financial prospects and forms the basis of the financial analysis. The main energy source is open loop geothermal supplemented by electric and natural gas boilers and conventional chillers to address peak demands. The key takeaways for option three are:

- GHG savings of 67% (3,060 tonnes/year) versus business as usual (BAU) and a small reduction in GHGs versus business as planned that includes high performance development standards. While this is smaller savings than modeled in the larger option 2, option 3 provides for system growth beyond the modeled customers, to improve environmental impact.
- It has the lowest initial capital requirements and best financial returns. These returns can be leveraged for future system growth beyond the initial customers.
- Helps secure customers who are ready to start construction in the next three to five years.

Lessons Learned from Other Municipalities

While there are several successful DESs in Ontario, across Canada and the world, there are lessons to be learned from communities with less successful DESs.

- People are the most significant factor in a successful DES. Strong alignment and drive throughout all internal stakeholders is paramount. Messaging to external stakeholders should be consistent and concrete. A “champion” for DE that leads the effort and drives decision making is key. Engagement with all stakeholders should be early, often, and continuous, and this messaging must continue even after the first customers are connected.
- While building owners receive multifaceted benefits from connecting to a DES, since DES rates are designed to be competitive with BAU, developers will typically not connect unless there are other incentives to do so. Successfully implemented incentives include a streamlined building application process if the building is designed to connect to DE (e.g. Markham).
- Having firm customer commitments is essential before investing the capital cost for infrastructure. If it is uncertain if customers will connect, there is a risk of oversizing the DES equipment and not being able to recuperate the cost of capital through revenue. Anchor customers should sign Thermal Energy Service Agreements with the DES provider before any construction begins. Anchor customers should be a substantial load for the system, and located near other buildings that would benefit from a connection to the DES, such that the infrastructure installed to serve them will be the foundation to connect future customers.

Next Steps

Based on the economic, resilience and environmental benefits of the project alongside positive financial returns, staff are recommending to advance Option 3.

STRATEGIC PLAN ALIGNMENT

This report supports Cultivating a Green City Together: Focuses a sustainable path to a greener, healthier city; enhancing & protecting parks & natural environment while transitioning to a low-carbon future; supporting businesses & residents to make climate-positive choices.

FINANCIAL IMPLICATIONS:

None to report at this time

COMMUNITY ENGAGEMENT:

CONSULT – Staff and consultants have engaged extensively with individuals at a number of internal and external organizations and agencies, including:

- City of Kitchener (Kitchener Utilities, Planning, Engineering, Transportation, Economic Development, Facilities Management and Parks);
- Region of Waterloo;
- University of Waterloo;
- Energy Industry and Climate organizations (i.e., Grand River Energy; WR Community Energy; Enova Power)
- Grand River Hospital;
- Federation of Canadian Municipalities (FCM);
- Development industry representatives from IN8, Momentum, Vive Developments, Van Mar, Rome Sales Inc, Perimeter Developments, Europro, Dov Capital, and Manulife to discuss their initial interest in connecting to DE and potential opportunities and implications on their projects.

PREVIOUS REPORTS/AUTHORITIES:

- [DSD-20-151](#) Downtown District Energy Pre-Feasibility Study and Business Case
- [DSD-2024-240](#) Bramm Yards Master Plan Visioning

Attachments

Attachment A - Downtown Kitchener District Energy System Technical and Financial Analysis – Public Release 2023