



Staff Report

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| Report To: | Planning and Development Committee | |
| Date of Meeting: | May 16, 2022 | Report Number: PDS-025-22 |
| Submitted By: | Ryan Windle, Director of Planning and Development Services | |
| Reviewed By: | Robert Maciver, Deputy CAO | By-law Number: |
| File Number: | | Resolution#: |
| Report Subject: | Clarington District Energy System | |

Recommendation:

1. That Report PDS-025-22, and any related delegations or communication items, be received for information.
2. That all interested parties be notified of Council's decision.

Report Overview

This report provides an update on the work underway to assess the feasibility of integrating low carbon district energy (DE) into the development of ongoing Secondary Plans in South Clarington, following action 1.24 of the [Clarington Climate Action Plan](#). This report includes: 1) an overview of the causes of climate change impacting Clarington and beyond; 2) an overview of low carbon DE; 3) the features that make South Clarington a desirable candidate for low carbon DE; 4) the findings of the recently-completed study looking at the feasibility of DE in South Clarington (**Attachment 1**) and; 5) the next steps that staff will take to enable Council to make an informed decision about whether to proceed with integrating low carbon DE into the ongoing development of Secondary Plans in South Clarington.

1. Background

- 1.1 Clarington's population is expected to grow to 123,900 people by 2026. Currently the Municipality is engaged in the development of 12 secondary plans and 2 watershed studies to assist in accommodating this new growth.
- 1.2 According to the Atmospheric Fund's [Durham-wide Community GHG emissions Inventory](#), buildings are responsible for 30% of greenhouse gas (GHG) emissions in Durham Region.
- 1.3 According to the [Intergovernmental Panel of Climate Change's \(IPCC\) Sixth Assessment Report](#) released in August 2021, human activities that release GHGs are warming the atmosphere, ocean, and land. These changes are already contributing to weather and climate extremes in every region across the globe, including the Great Lakes Region.
- 1.4 According to the [IPCC report Global Warming of 1.5 degrees Celsius](#), GHG emissions need to be drastically reduced to avoid catastrophic climate change.
- 1.5 Climate science indicates that there is a narrow window to limit further warming to below 1.5°C above pre-industrial levels, a threshold that if exceeded would bring catastrophic and irreversible climate change. Maintaining temperatures below this threshold will require dramatic reduction in GHG emissions across all sectors of society and coordinated action across all levels of government.
- 1.6 To avoid the worst impacts of climate change and protect the wellbeing of residents, municipalities, including Clarington, must take actions to reduce GHG emissions from buildings.

2. Context

- 2.1 Clarington is responding to climate change. In early 2015, the Municipality established the Priority Green Clarington initiative, which resulted in a framework for sustainable residential developments (beyond code) and a household water and energy efficient demonstration project. ([PSD-060-15](#)).
- 2.2 In late 2019, the Municipality released the [Clarington Energy Conservation and Demand Management Plan 2019-2024](#) (ECDM plan). The ECDM plan identifies actions that the Municipality is taking to conserve energy, reduce GHG emissions and save money in Municipal buildings.
- 2.3 In November 2019 Council Endorsed the [Durham Community Energy Plan](#) (DCEP), which seeks to accelerate the transition to a clean energy economy in Durham, while simultaneously achieving economic, environmental, and social benefits. The DCEP prioritizes the implementation of low carbon energy solutions in Durham Region, including district energy systems, which account for 16 per cent of total emissions reductions within the Region's low carbon pathway.
- 2.4 In February 2020, Council passed a motion to prioritize the use of low emissions vehicles in the municipal fleet, reducing corporate GHG emissions that contribute to climate change. ([Resolution: #C-066-20](#)).
- 2.5 On February 18, 2020, the Municipality of Clarington declared a climate emergency "framing and deepening our commitment to protecting our economy, ecosystems and community from climate change".
- 2.6 In March 2021, Council endorsed the Clarington Corporate Climate Action Plan ([PSD-018-21](#)). The CCCAP contains 116 actions to respond to limited risks posed by climate change and establishes corporate GHG emissions reduction targets. The CCCAP sets a target to reduce corporate GHG emissions to 35% below 2018 baseline levels by 2030 and to achieve net-zero emissions by 2050

3. District Energy

- 3.1 As per action 1.24 of [Clarington's Corporate Climate Action Plan](#), Clarington staff have partnered with the Region of Durham to investigate the feasibility of integrating low carbon DE into Secondary Plans in South Clarington.

What is District Energy?

- 3.2 DE systems are centralized systems where thermal energy (i.e., heating and cooling) is distributed from a central location or several locations via underground pipes to multiple buildings in a neighbourhood, downtown district, or campus (**Figure 1**).

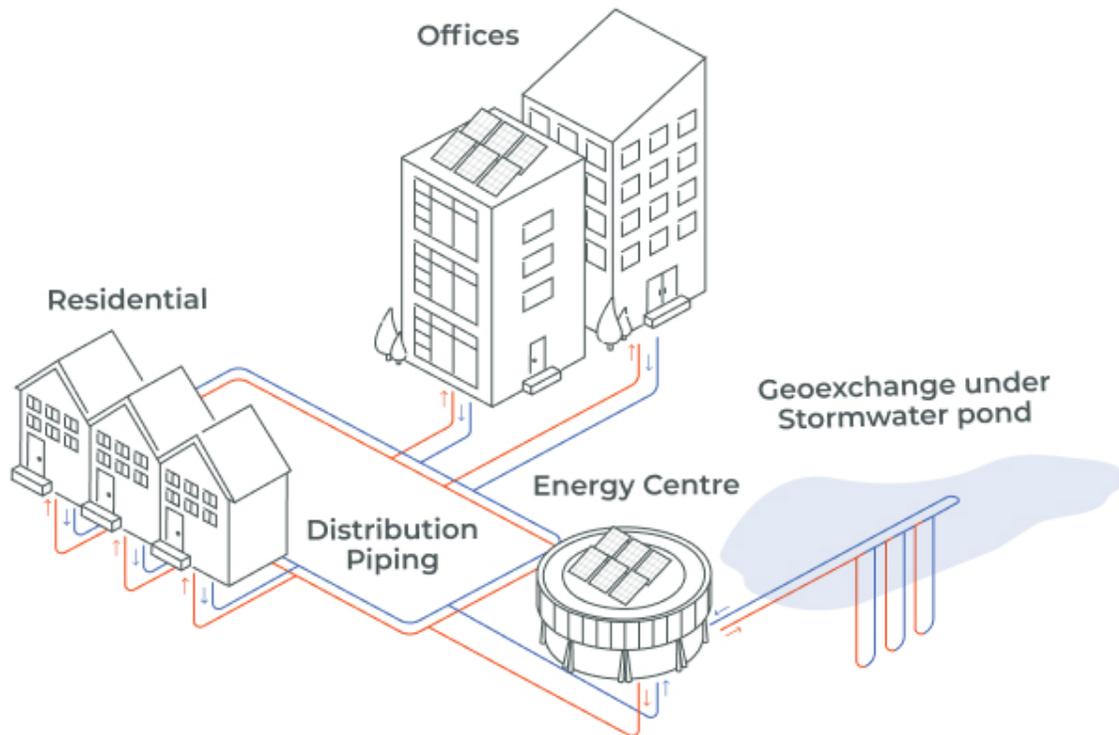


Image source: Blatchford Renewable Energy. <https://blatchfordutility.ca/district-energy-sharing/>

Figure 1. Example of a DE System

- 3.3 Without individual boilers, furnaces or chillers, buildings connected to a DES benefit from increased energy efficiency, fuel flexibility, brought on by economies of scale, and additional productive space in buildings.
- 3.4 The improved efficiencies and potential for low-carbon fuel sources in DE systems make them a key part of climate change and renewable energy strategies in urban areas.
- 3.5 A DE system functions to distribute steam, hot and/or cold water into commercial, residential, and industrial buildings where it can be used for heating and cooling, as well as electricity production.
- 3.6 Buildings connected to the thermal grid do not need their own boiler or furnaces, chillers, or air conditioners. Examples of buildings commonly connected to a thermal grid can include commercial buildings, residences, condominiums, hotels, sports facilities, university facilities, and government buildings.
- 3.7 DE networks transport heat and cooling efficiently up to 30 kilometers from any single heat source. When multiple heat sources are combined, networks can be hundreds of

kilometers long. This allows for heating and cooling services to be established across neighborhoods, industrial areas, entire cities, and regions.

- 3.8 DE networks can balance the supply and generation of heat by time and location. As the heat demands change throughout the day for residential, commercial, industrial, institutional, and public buildings, the heat network matches and manages these changing patterns, while ensuring the most efficient and lowest cost mix of heat sources are used.
- 3.9 A DE network enables a wide range of heat sources to be combined, many of which have lower costs, lower emissions, and greater reliability than current building heating and cooling systems.
- 3.10 Heat can be captured and added to the network from any process that produces waste heat including power generation, industrial processes, solar thermal panels, biomass generation and geothermal processes. There are no requirements that energy sources should be from a single source.
- 3.11 DE systems are typically run as a thermal utility by a company that operates the heating and cooling network, ensures quality service, and manages metering and billing.
- 3.12 A DE network allows for reduced overall energy consumption and GHG emissions, since generating heat in few larger plants and capturing and using waste heat from industrial producers is more energy efficient than having hundreds of boilers, furnaces and air conditioners heating and cooling individual buildings.

Benefits of District Energy

- 3.13 Lower Costs and Price Stability - District heating systems can source heat from a mix of conventional, clean, and renewable waste sources. Sourcing energy locally and from a variety of sources reduces price volatility and increases reliability.
- 3.14 District heating and cooling systems have none of the costs normally associated with in-building heating and cooling systems, including boilers, storage tanks, air conditioning units and other associated equipment. Also, cost-related insurance, equipment-maintenance, upgrades, and replacement are eliminated.
- 3.15 Revenue Generation - DE can generate a significant amount of revenue through heating/cooling sales, power sales, connection charges, ancillary services, and capacity payments. As an investment, DE can provide stable investment returns to the community for many decades. In addition, since most heat sources are local, more energy dollars remain within the local economy.
- 3.16 Enhanced Comfort - A DE system allows building operators to manage and control their own indoor environments. DE is available whenever a building needs heat. In addition, DE reduces vibrations and noise problems that could annoy building occupants.

- 3.17 Flexible Building Design - The elimination of the conventional or traditional HVAC system requirement expands the number of possible building design options. A building free of boilers and chillers provides architects with greater building design flexibility.

District Energy in South Clarington

- 3.18 Clarington is in an ideal position to explore implementing DE. Sources for low carbon waste heat are in close proximity to several Secondary Plan areas, which could supply affordable, low carbon heat to the Clarington Waterfront and Energy Business Park (Figure 2), Courtice Transit-Oriented Community (TOC) and GO Station Area Secondary Plan (Figure 3), and surrounding areas.



Figure 2 – Courtice Waterfront and Energy Business Park

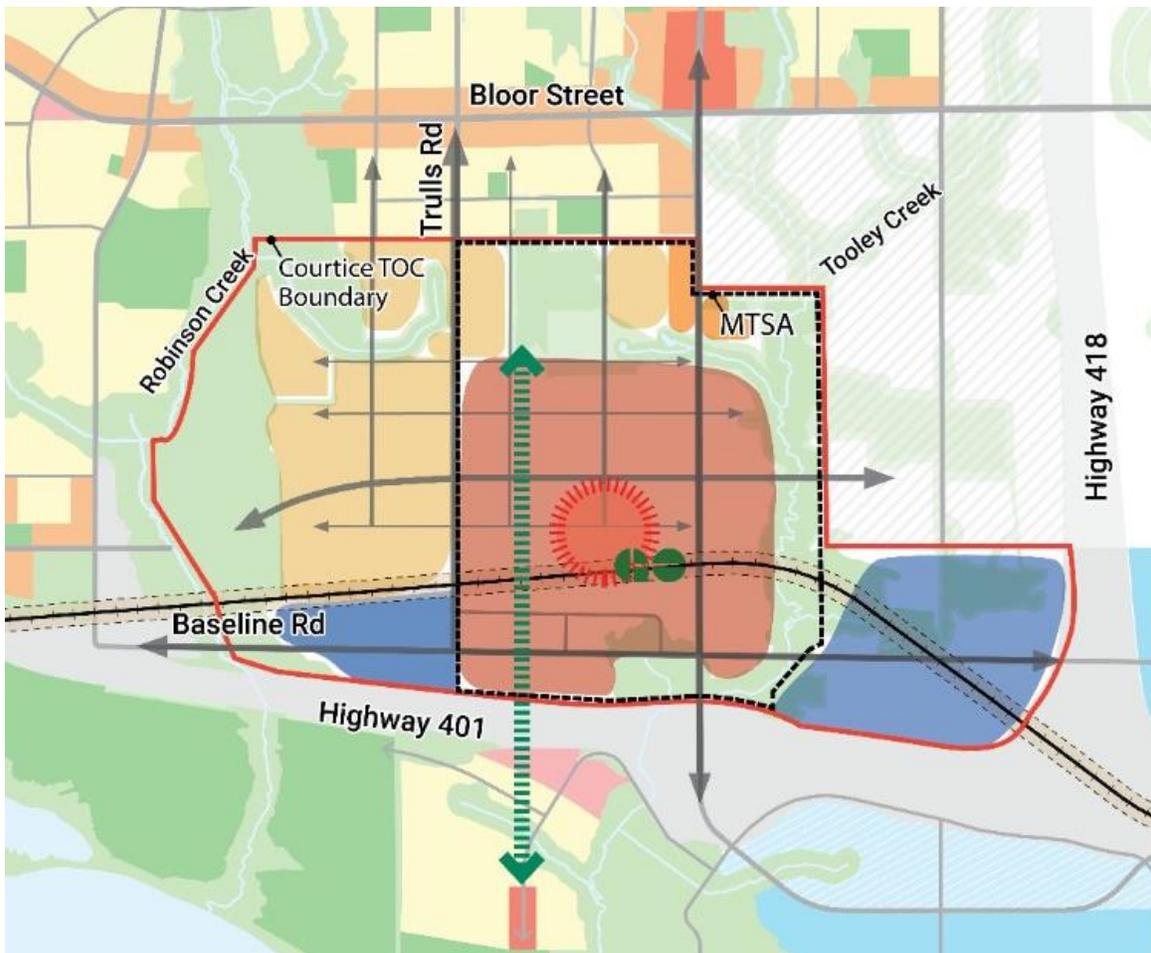


Figure 3 – Courtice Transit-Oriented Community (TOC) and GO Station Area Secondary Plan

3.19 The Clarington Waterfront and Energy Business Park is unique in the abundance of thermal generation sources which could be captured and used in a low carbon DE system. These sources include:

- Steam extraction from the Durham York Energy Centre
- Waste heat recovery from Darlington Nuclear Plant
- Combustion of excess digester gas from the Courtice Water Pollution Control Plant
- Sewer and Effluent Heat Recovery at the Courtice Water Pollution Control Plant

3.20 Additional sources of energy that could be incorporated into a low carbon DE system in the future include:

- Geo-Exchange
- Biomass
- Solar Power / Solar Thermal
- Waste heat recovery from a small modular reactor (SMR)

- 3.21 The establishment of district energy heating in these new developments has the potential to significantly reduce greenhouse gas emissions, reduce community energy expenses, increase community energy stability and resilience, and create a new revenue stream for the Municipality (if a participant in development).
- 3.22 Currently, the Clarington Waterfront and Energy Business Park and Courtice TOC and GO Station Area Secondary Plan areas and surrounds are relatively undeveloped. As part of the development process, utilities and services will need to be installed, which is the ideal time to install DE piping and infrastructure.
- 3.23 The densities for the Clarington Waterfront and Energy Business Park, and projected density for the Courtice TOC and GO Station Area Secondary Plan areas and surrounds are ideal for the installation of low carbon DE.

Policy Supporting District Energy

- 3.24 Action 1.24 of Clarington's Corporate Climate Action Plan of the plan is to “Investigate the feasibility for a District Energy System in new and existing secondary plan areas.”
- 3.25 Item 7.2.10 of the Clarington Energy Business Park Secondary Plan (2006) states “At the appropriate time, but before the area of the Clarington Energy Business Park has been 50% developed, the Municipality and the Regional Municipality of Durham shall consider the feasibility of building a district heating and cooling facility to serve the park.”
- 3.26 Item 13.1.5 of the York Durham Energy Centre Host Community Agreement states that Clarington and Durham will “strongly encourage and promote development within the Clarington Energy Business Park and other areas of Clarington to utilize district heating and cooling provided by the EFW Facility.”
- 3.27 The Municipality of Clarington and the Region of Durham hold the legislative ability to integrate low carbon solutions such as DE into community planning. Within the *Ontario Municipal Act 2017*, Ontario Municipalities are empowered to take actions to respond to climate change and lead community energy planning. Integrating low carbon energy solutions from local fuel sources into community designs limits GHG emissions that contribute to climate change and provide greater energy security to residents.

4. FVB Prefeasibility Study

- 4.1 In late 2021 the Municipality of Clarington and the Region of Durham partnered to explore the high-level feasibility of incorporating DE into the Secondary Plans in South Clarington (**Attachment 1**).
- 4.2 The Region procured FVB Energy to conduct the pre-feasibility study. The study evaluated potential for an area-wide DE system serving development forecasted to

2070, with a total capital cost of \$236 million dollars, and over 23 km of distribution piping.

- 4.3 Phase 1 of the Clarington District Energy Study (DES) proposed by FVB has an estimated capital cost of \$112 million, with over 10 km of distribution piping and an Energy Centre in a new facility designed to house the equipment for all seven DES phases.
- 4.4 The study concluded that there is great potential for a low-carbon DES in Clarington supplied by low carbon heat from the waste heat sources outlined in sections 3.19 and 3.20 above, with significant revenue-generation potential.
- 4.5 However, the study is high-level in nature, exploring the maximum potential for DE in Courtice over the next 48 years.
- 4.6 While the study's findings are favourable towards DE in South Clarington, additional work is required to translate the long-term conceptual work into an implementation plan for a potential Phase 1 of DE development.

5. Next Steps

- 5.1 While the pre-feasibility study demonstrated very promising high-level conditions for low carbon DE, further analysis is needed to map out the short-term viability of integrating DE into the Clarington Waterfront and Energy Business Park, Courtice TOC and GO Station Area Secondary Plan areas and surrounds.
- 5.2 Regional Staff with the assistance of Clarington intend to prepare a Request for Proposal (RFP) for additional research and a detailed plan to inform decision making and next steps to integrate of DE into the Clarington Energy Business Park, Courtice TOC and GO Station Area Secondary Plan, and surrounding areas. The RFP will be issued by the Region of Durham.
- 5.3 Regional and local staff will seek funding and partnerships with various stakeholders to undertake this research including: the Region of Durham, Local Distribution Companies, Developers and Provincial and Federal Government.
- 5.4 Additional research will address several key areas including:
 - Scoping and defining Phase 1 of DE for short term installation;
 - Staging and integration into existing Secondary Plan processes;
 - DE utility ownership, governance, and administration;
 - Identifying and limiting risks associated with DE;and
 - Clarifying the DE business case and value proposition for a phase 1 DE project.

5.5 Once complete, the Region and Clarington would be positioned to make informed decisions about whether to pursue DE, including:

- Seeking utility partners to help deliver the system, through a request for expressions of interest;
- Engagement with development community to build understanding of DE and its value proposition, and discuss options for incentivizing/requiring connection; and
- Prepare funding applications to support design and construction (e.g., Canada Infrastructure Bank).

6. Concurrence

6.1 Not Applicable

7. Conclusion

7.1 Clarington is in an ideal position to explore DE as a source of low carbon energy in partnership with Durham Region for the South Clarington area. Sources of low carbon waste heat are in close proximity to several Secondary Plan areas, which could supply affordable, low carbon heat to the Clarington Waterfront and Energy Business Park, Courtice TOC and GO Station Area Secondary Plan areas and surrounds. The establishment of a DE in these new developments has the potential to significantly reduce greenhouse gas emissions, reduce community energy expenses, increase community energy stability, and create a new revenue stream for the Municipality.

Staff Contact: Doran Hoge, Energy and Climate Change Response Coordinator, 905-623-3379 ext. 2429 or dhoge@clarington.net.

Attachments: **Attachment 1** – Clarington DES Study

The following interested parties will be notified of Council's decision:

Durham Region Home Builders Association
The Region of Durham