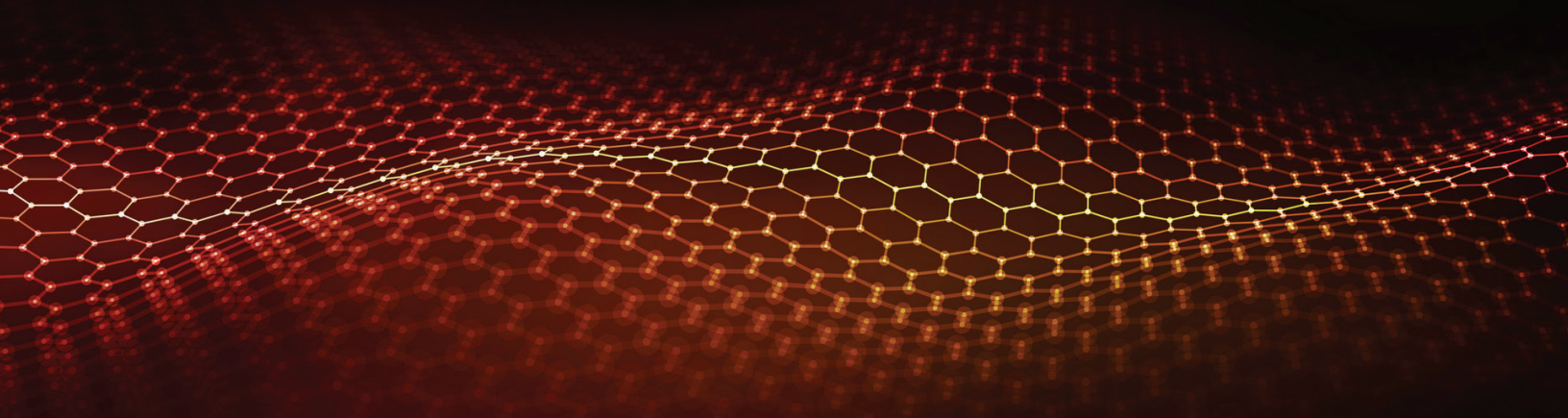
HAMILTON COMMUNITY ENTERPRISES



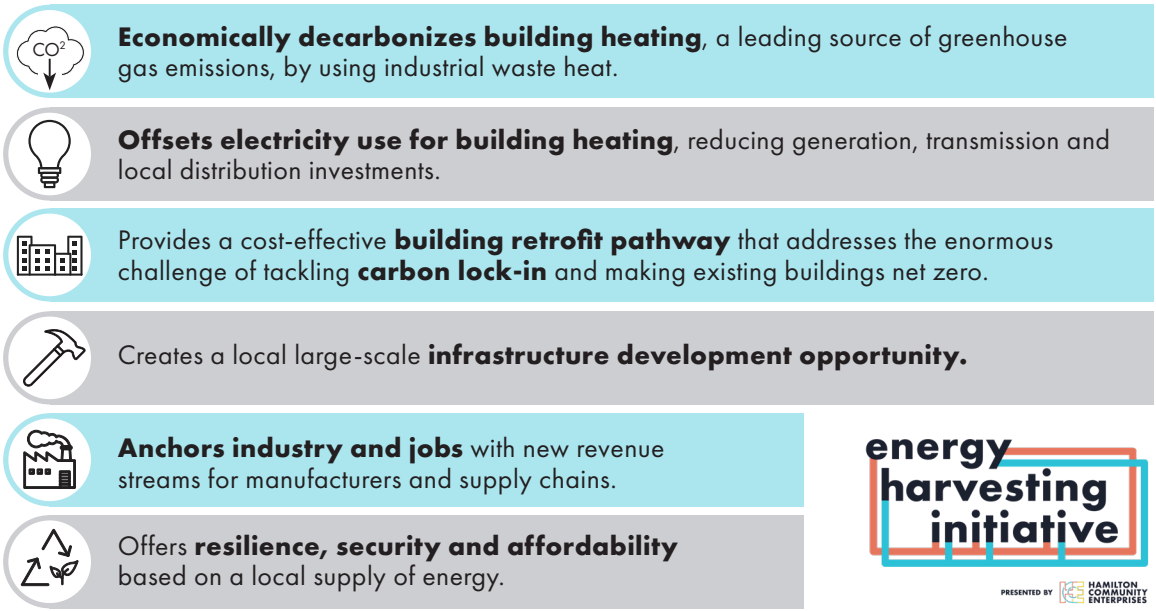
2025 Hamilton
ENERGY HARVESTING
Feasibility Study Overview

In Support of Canada's Thermal Corridor

energy harvesting initiative

PRESENTED BY HAMILTON COMMUNITY ENTERPRISES

Canada's Thermal Corridor



Preface

The following Hamilton Energy Harvesting Feasibility Study presents an optimal example of what is possible for district energy in the Hamilton area and reflects practices, policies and regulations in place during its development from January 1, 2023 to December 31, 2024. An example is the inclusion of consumer carbon pricing in the analysis. As such, it represents a moment in time in a rapidly evolving Ontario and Canada.

All participants in the Study have acted in good faith. However, they are not bound in any manner for the information provided nor do they have any binding obligation or commitment to participation in a resulting Project.

Several potential customers of waste heat have been included on the basis of publicly available information and due to time constraints, have not been contacted nor agreed to participate in the Study. As such they are not bound in any way with respect to their potential participation in the Feasibility Study or a resulting Project.

 This project was carried out with assistance from the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

Report designed by Amber Routten-Mitchell | Imagery: iStock.com

Overview

This document summarizes processes, findings and recommendations from the Hamilton Energy Harvesting Study led by Hamilton Community Enterprises (HCE) from January 2023 through December 2024. The Atmospheric Fund and the Federation of Canadian Municipalities were the two major funders of the Study. Other contributors from the public and private sectors provided additional funding and in-kind support.

An earlier report published by the Hamilton Chamber of Commerce in 2021 laid the groundwork for this Study. It found that manufacturers operating along Hamilton's industrial bayfront produce enough residual thermal energy to heat approximately 80 million square feet of building space, resulting in a significant reduction in local carbon emissions totalling more than 200,000 tonnes annually.

The follow-on study summarized here set out to determine the long-term viability of a proposed green infrastructure project intended to harness waste heat from Hamilton's Bayfront Industrial Area as a fuel source for an expanded district energy system (DES) serving customer buildings in downtown Hamilton and beyond. Emphasis was placed on the requirements needed to build, operate, and maintain the proposed DES.

A conservative approach was taken in the Study, which included using an achievable market penetration for the DES. As a result, the Study Team concentrated more on energy demand than supply.

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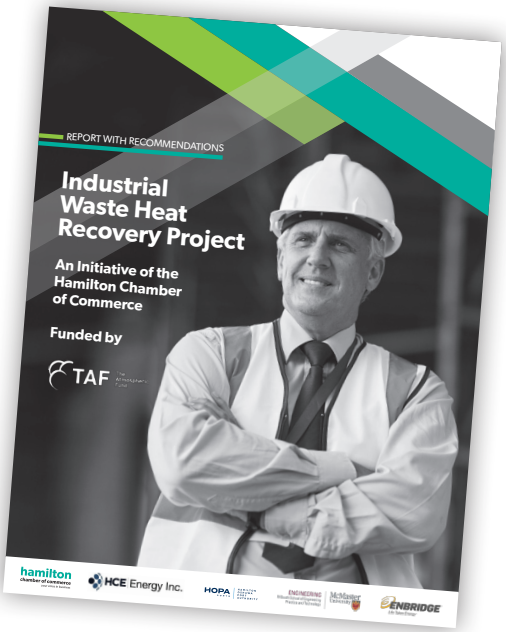
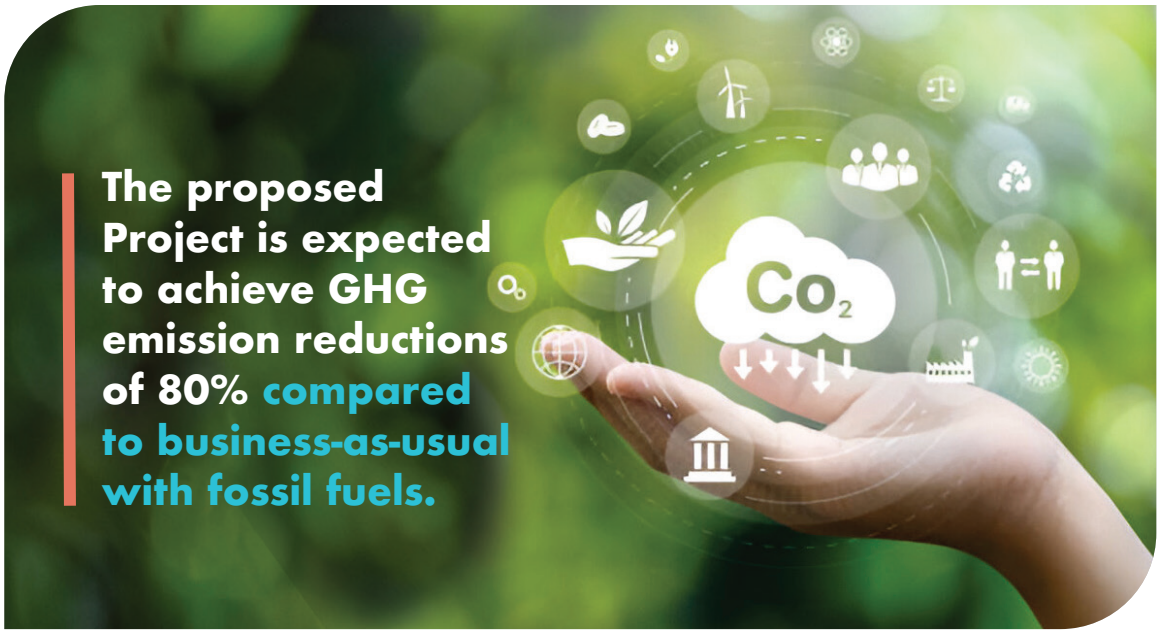
Study Lead

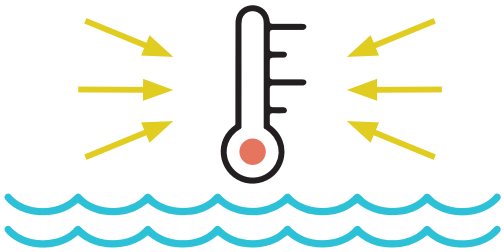
Hamilton Community Enterprises is an energy and telecom business owned by the City of Hamilton and devoted to building and operating smart infrastructure — including district energy systems — serving customers across all sectors of the economy. This Study is part of a comprehensive plan to grow and decarbonize Hamilton's existing district energy system with a focus on the incorporation of distributed energy resources, including industrial waste heat.





A commercially viable business case was proven and de-risked based on stakeholder inputs, local market demand and competitive pricing benchmarked against business-as-usual building heating provided by burning fossil fuels.

The business case was modelled on a global benefits framework that recognizes the importance of delivering tangible value to all parties involved in a DES, including energy suppliers, users, distributors, and investors. It reflects a 30-year Project term.



How the Thermal Corridor Would Work

Space heating and hot water would be provided by a closed loop hot water energy distribution network that transmits heat recovered from a variety of industrial processes. Thermal inputs would be harvested from otherwise wasted heat using heat exchangers and heat pumps. The loop would then send heat in the form of hot water to buildings where dedicated energy transfer stations consisting of heat exchangers and controls take the place of natural gas furnaces and boilers to provide space heating and domestic hot water. This heating solution is highly effective and commonly used in cold climate communities worldwide.

Notably, the business case defined the terms of waste heat sale, green heat purchases, operating costs, and investment returns for the infrastructure. Extensive sensitivity analyses were applied.

The introduction of grants and financing, especially low-cost funding from a source such as the Canada Infrastructure Bank, significantly improved the Project's returns to those expected for utility/infrastructure-type projects. It would not be expected that an initiative of this nature would proceed on a non-financed basis, as the application of grants and low-rate financing is generally the norm for long-term infrastructure projects, including those in the district energy space.

The Study also proved the Project's technical feasibility using existing technologies and practices commonly employed in industrial applications, DES and waste heat recovery projects.

A detailed risk register with mitigation strategies was also developed. Many of the identified risks are typical for a large multi-year infrastructure project. Mitigation of these risks will be a focus for the next stages in Project development.

The Study developed an initial five-phase DES that would be built over the coming ten years. It would begin with underground pipe connections from waste heat suppliers in Hamilton's Bayfront Industrial Area to the Hamilton General Hospital campus in Phase 1, followed by an extension to HCE's existing downtown district energy system in Phase 2.

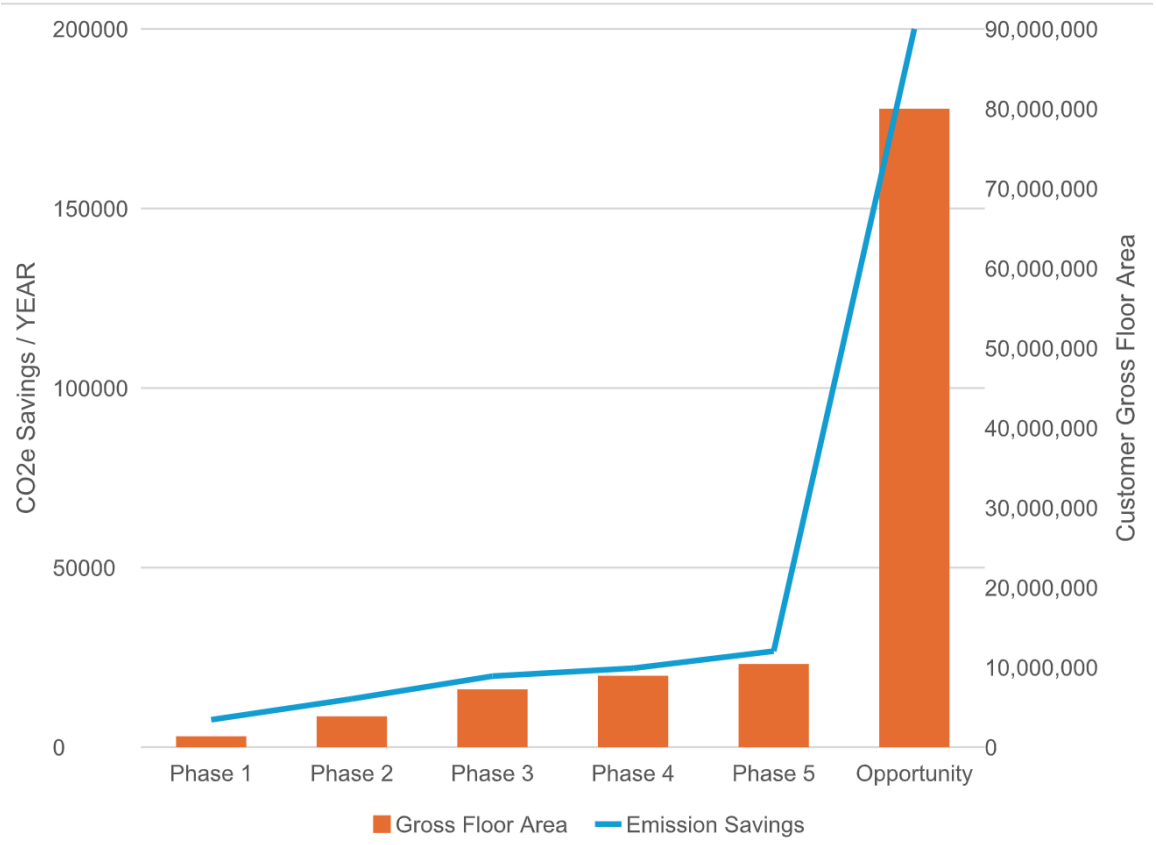
When these initial five phases are complete, the DES will meet an annual heating demand of 143,000 MWh, with a peak demand of 51 MW, and reduce annual GHG emissions by more than 27,000 tonnes or 80% from business-as-usual.

Anticipated Results from the Project's First Five Phases

$250 million infrastructure investment over ten years	**80% reduction** in GHGs versus business-as-usual – an estimated 27,000 tonnes per year improvement	**143,000 MWh** per year of recycled green heat
50,000 MWh per year of electrical conservation with an electrical peak reduction of 13 MW	**$247 million** savings in new electrical generation, transmission and distribution infrastructure in the first 10 years	**$12 to $33 million** in additional profits for industry over the Project term

The Study revealed that this is just the beginning. The graph below plots the exponential growth potential of the proposed DES:

STUDY FINDINGS POINT TO THE LONG-TERM IMPACT OF THE PROPOSED PROJECT



Key Results and Recommendation

What started as a quest to decarbonize building heating in downtown Hamilton has evolved into **Canada's Thermal Corridor**, defined as:

- A commercially viable and technically feasible method of low-carbon building heating
- An electrical grid displacement mechanism and conservation measure
- A cost-effective building retrofit pathway to address carbon lock-in of existing buildings
- A large-scale local infrastructure development opportunity
- An anchor to local industry and jobs
- A local source of energy to help ensure resilience, security and affordability

The key results of the Study — measured in economic, social, environmental, and governance terms — demonstrate the Project's commercial viability and technical feasibility, and make a positive case for advancing to the next steps in development.

> There is a significant opportunity for the Hamilton community to develop a world-class district energy system that will enable the City of Hamilton to achieve its GHG reduction targets and climate action goals while growing the local economy.

Next Steps

Based on the positive results of this Study, the key next step toward building Canada's Thermal Corridor is to proceed with a pre-construction Commercialization Phase of development.

In this phase, the proven business case will evolve with greater Project certainty by firming up supply and demand, securing funding and financing, and refining engineering.

The Study Team also identified the need to explore ways to share learnings and recommendations from the Hamilton Energy Harvesting Study with other communities across Canada in the context of climate action, sustainable development, and the transition to a low-carbon economy.

Learn More

Visit HCE.net/reports to download:

- Hamilton Energy Harvesting Feasibility Study Full Report
- A related study by McMaster University titled "The Role of Policy and Regulation in Advancing District Energy Systems"
- A related study by Mohawk College Centre for Climate Change Management titled "Techno-Economic Analysis of the Viability of Thermal Energy Storage Within Hamilton's Bayfront Industrial Area"

Funders, Supporters and Contributors

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