



**Partners in
Project Green**

A Program of Toronto and Region Conservation Authority

Energy Leaders Consortium

District Energy at Sheridan College

June 15, 2023

We respectfully acknowledge that we are situated on the Traditional Territories and Treaty Lands, in particular those of the Mississaugas of the Credit First Nation, as well as the Anishinaabe of the Williams Treaty First Nations, the Huron Wendat, the Haudenosaunee, and the Metis Nation.

As stewards of land and water resources within the Greater Toronto Region, Toronto and Region Conservation Authority appreciates and respects the history and diversity of the land and is grateful to have the opportunity to work and meet on this territory.



Additional Resources

- yrnature.ca/acknowledging_land
- edgeofthebush.ca
- native-land.ca
- Text 1-855-917-5263 with your City and Province to learn whose traditional territory you're on
(standard text messaging rates may apply)



A Collaborative Space for All

Proposed Operative Values for ELC meetings:

1. Balance airtime to hear from as many voices as possible
2. Be curious and challenge our own assumptions and biases
3. Be open to building on each other's suggestions or taking the conversation in another direction
4. We are here to tackle climate action as a community



Agenda

Time	Activity
8:30am – 9:00am	Arrival and Networking
9:00am – 9:10am	Welcoming Remarks, Introduction, & Updates from PPG
9:10am – 9:50am	Sheridan College Presentation
9:50am – 10:35am	Hamilton Community Enterprises Presentation
10:35am – 11:00am	Q&A/ Discussion
11:00am – 12:00pm	Sheridan College Tour
12:00pm – 12:05pm	Closing Remarks
12:05pm – 12:30pm	Networking and session end





Introduction

Upcoming ELC Sessions & PPG Events

Date	Topic
June 19th 9:00am –5:30pm	External event: The Canadian Circular Economy Summit presented by the Circular Economy Leadership Canada (CELC) and the Circular Innovation Council (CIC).
June 22nd 1:00pm-4:00pm	Financing Net-Zero: Financial Institutions – learn about the funding available from Canadian banking institutions from HSBC. The last of this series!
July 13th 1:00pm – 2:30pm	ELC technical webinar: Reducing Scope 3 Emissions with Carbonzero. Please complete the pre-meeting survey if you haven't already.
August 17th 1:00pm-2:30pm	ELC Roundtable- Renewables with Ferrero: join us online to hear from Jeremy LaFlamme as he shares information on their PPA (solar, wind farms and battery bank). A calendar invite has been sent.

Please contact Julia Kole if you are interested in hosting an ELC Site Visits, have a presentation topic suggestion or would like to present at a Member Roundtable this year



Updates and Reminders

- **Scope 3 feedback survey due June 29th**
 - This will help focus the content presented by Carbonzero to the ELC on July 13th
 - Survey Link: <https://partnersinprojectgreen.com/energy-leaders-consortium-tackling-your-scope-3-pre-session-survey/>
- **Mississauga Climate Leaders Program application due June 30th**
 - Be a part of their GHG Emission Reduction Plan Training, GHG Emission & Energy Efficiency Site Assessment, and be featured as a Climate Leader
 - For more information please go to <https://www.thefutureisunlimited.ca/climate-leaders-program/>
- **NRCan GIFMP Track 2 and webinars**
 - Now accepting proposals from industrial facilities due July 31st, 2023. Webinars related to this program coming soon; we will notify members when we get updates.
- **We are looking to grow the ELC!**
 - Please help us connect with stakeholders or industry leaders you have connections with who would be a great addition to the consortium.



Today's Presenters



Evan Green, Manager, Engineering for Sustainable Development, Sheridan College

evan.green@sheridancollege.ca

Evan Green is leading a team of engineers to implement capital programs addressing energy, water, and greenhouse gas management consistent with Sheridan's net-zero and circular economy goals. Evan holds a Bachelor of Engineering from the University of New Brunswick and a Master of Sustainable Energy Policy from Carleton University. He is a registered Professional Engineering in Ontario, Certified Energy Manager, and Certified Building Commissioning Professional.

Sheridan



Today's Presenters



Jeff Cowan, CEO, Hamilton Community Enterprises (HCE)

jeff.cowan@hce technologies.com

For over 20 years, Jeff has enjoyed challenging the status quo through creating disruptive product strategies across the non-regulated Energy and Telecommunication sectors for both start-up and Fortune 500 organizations. In 2015, Jeff joined Hamilton Community Enterprises (HCE) as the Chief Technology Officer and now serves as the President and CEO of HCE leading its commercial operating subsidiaries HCE Energy and HCE Telecom.



Jeff also holds the position of President and CEO of Hamilton Utilities Corporation and sits on the Mayor of Hamilton's Intelligent Community Committee. He holds a Bachelor of Engineering and is a licensed Professional Engineer in Ontario.





Sheridan College Presentation



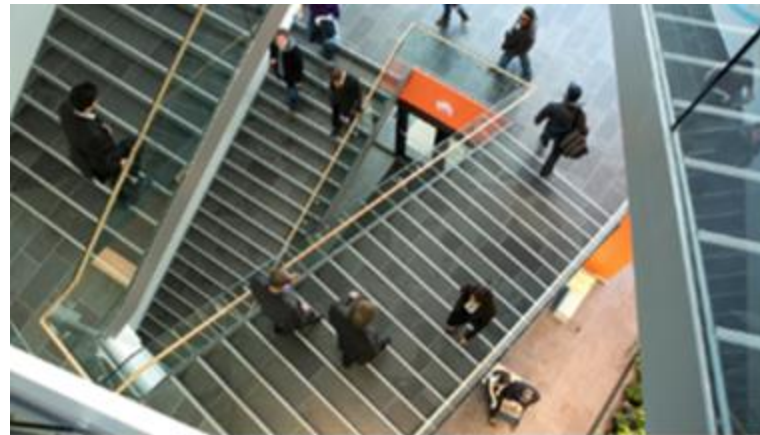
Sheridan's District Energy Journey
ELC District Energy

Evan Green, Sheridan College
June 15, 2023

About Sheridan



Davis Campus, Brampton



Hazel McCallion Campus, Mississauga



Trafalgar Road Campus, Oakville

Organizational Outlook



POSTURE

Policy Driven

Policy Compliant

Self-Directed

Policy Driver

PLANNING

Incremental

Stretch

Breakthrough

Transformational

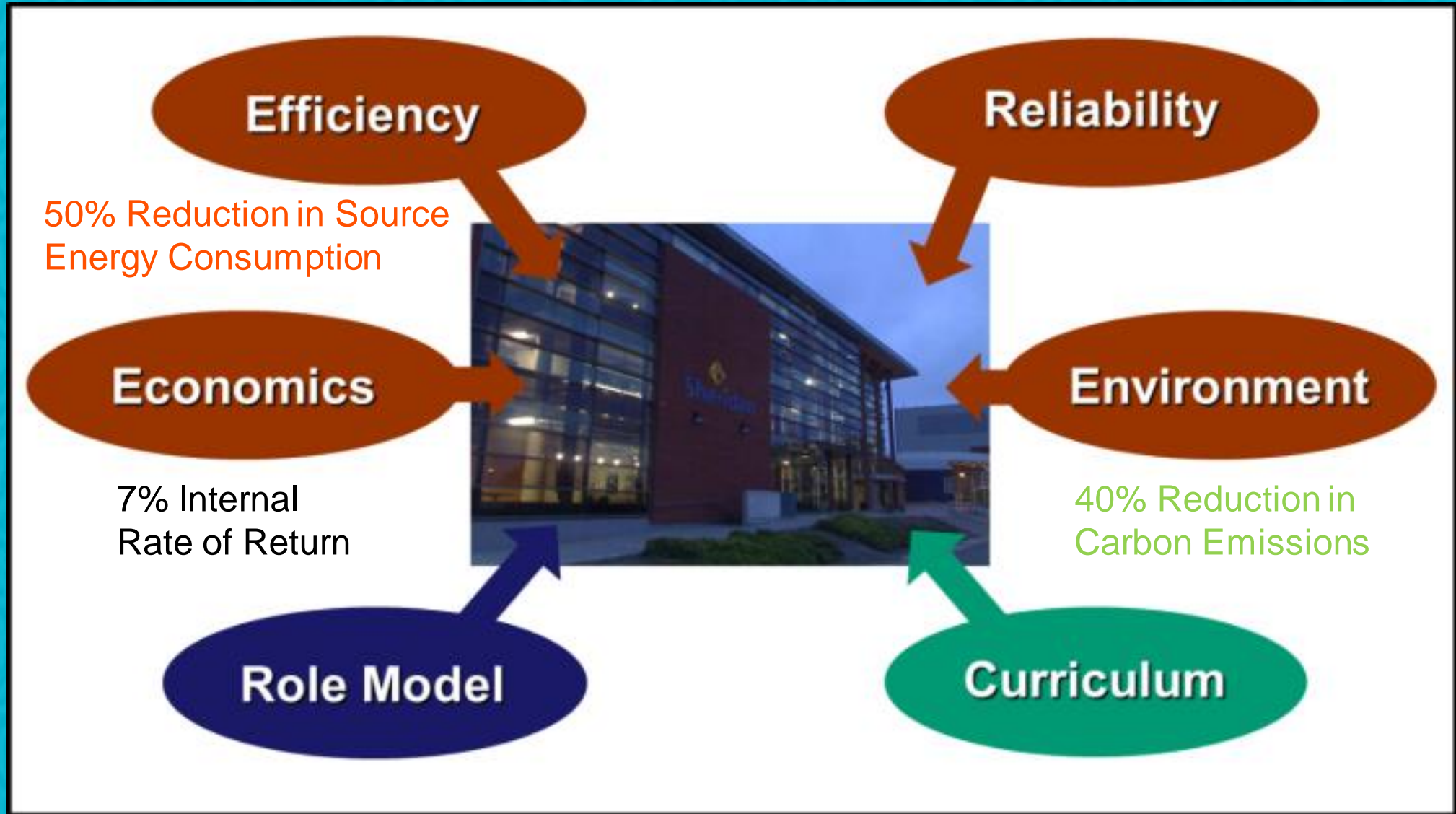
PERSPECTIVE

Reactive

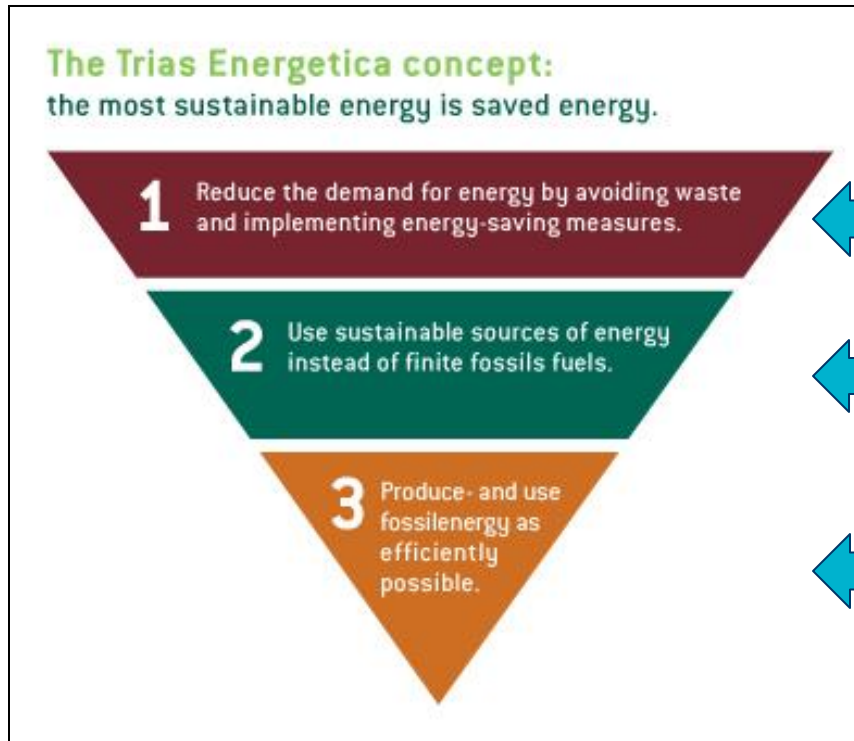
Managing

Proactive

Revolutionary



Trias Energetica



Efficient Use

- Active Management, Engagement & Efficient Structures

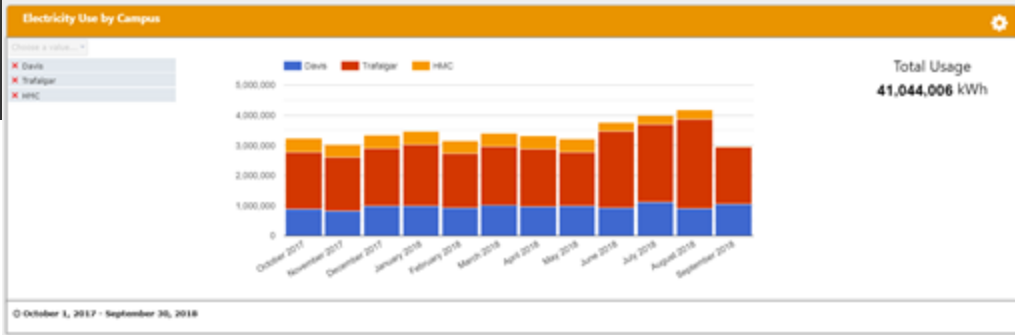
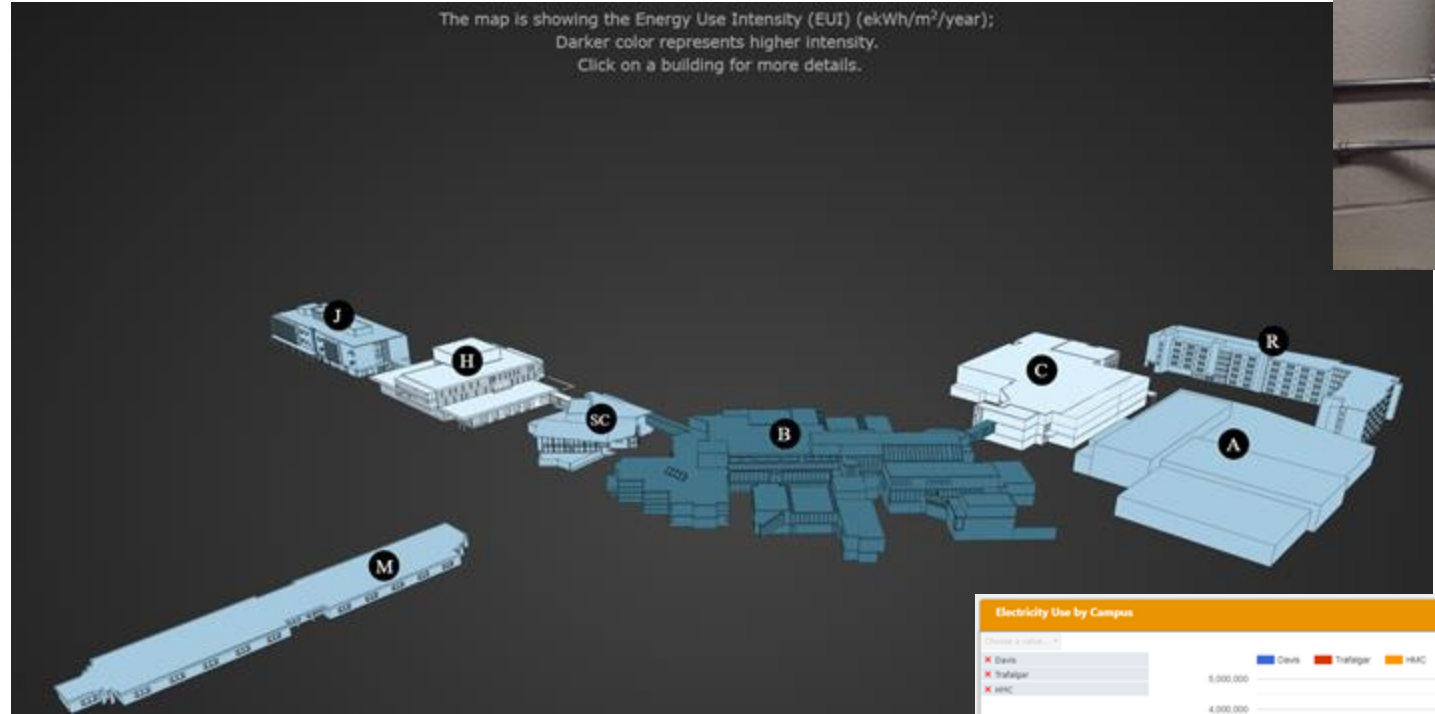
Efficient Distribution

- Heating, cooling, gas and electricity

Efficient Supply

- Conventional on- and off-campus
- Clean & Renewable

METERING



BUILDING ENVELOPE



BUILDING AUTOMATION



LIGHTING CONTROL

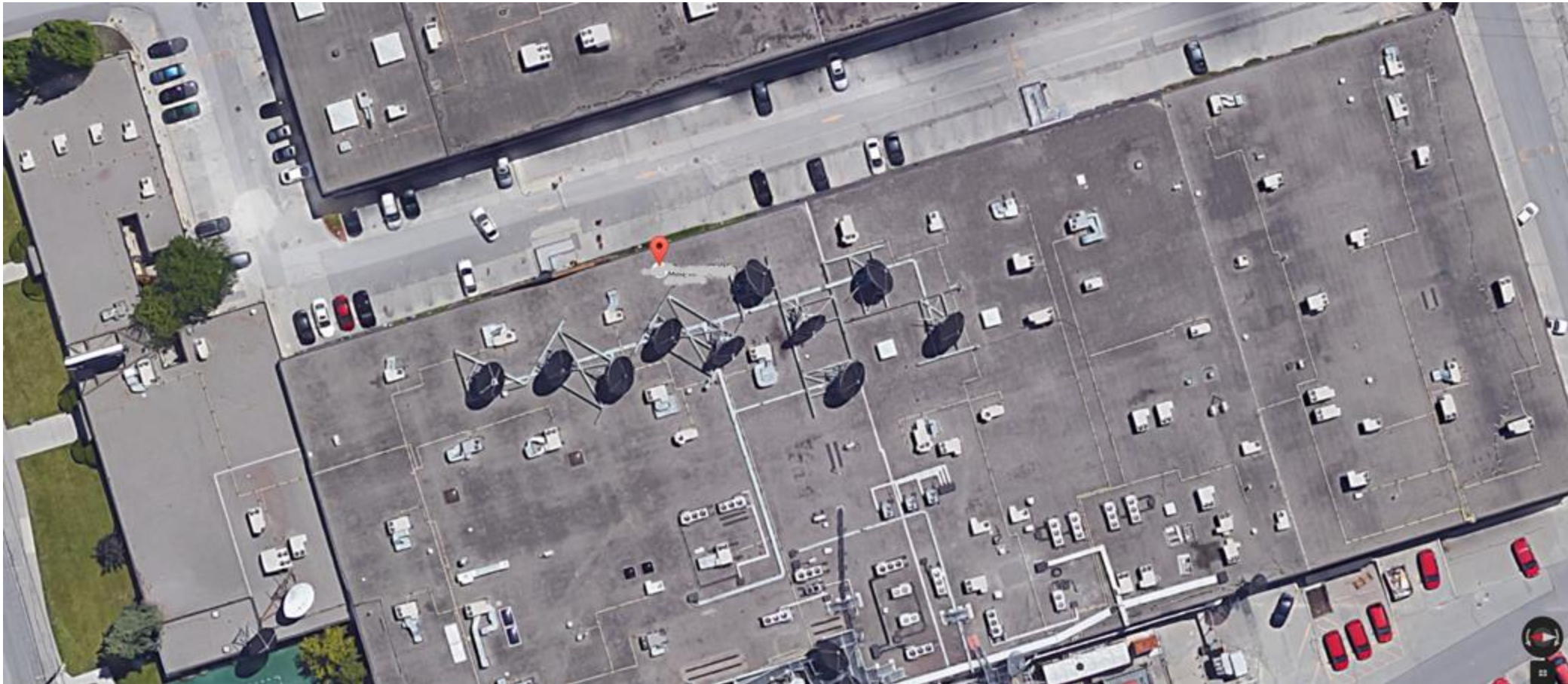


Standards for New Buildings



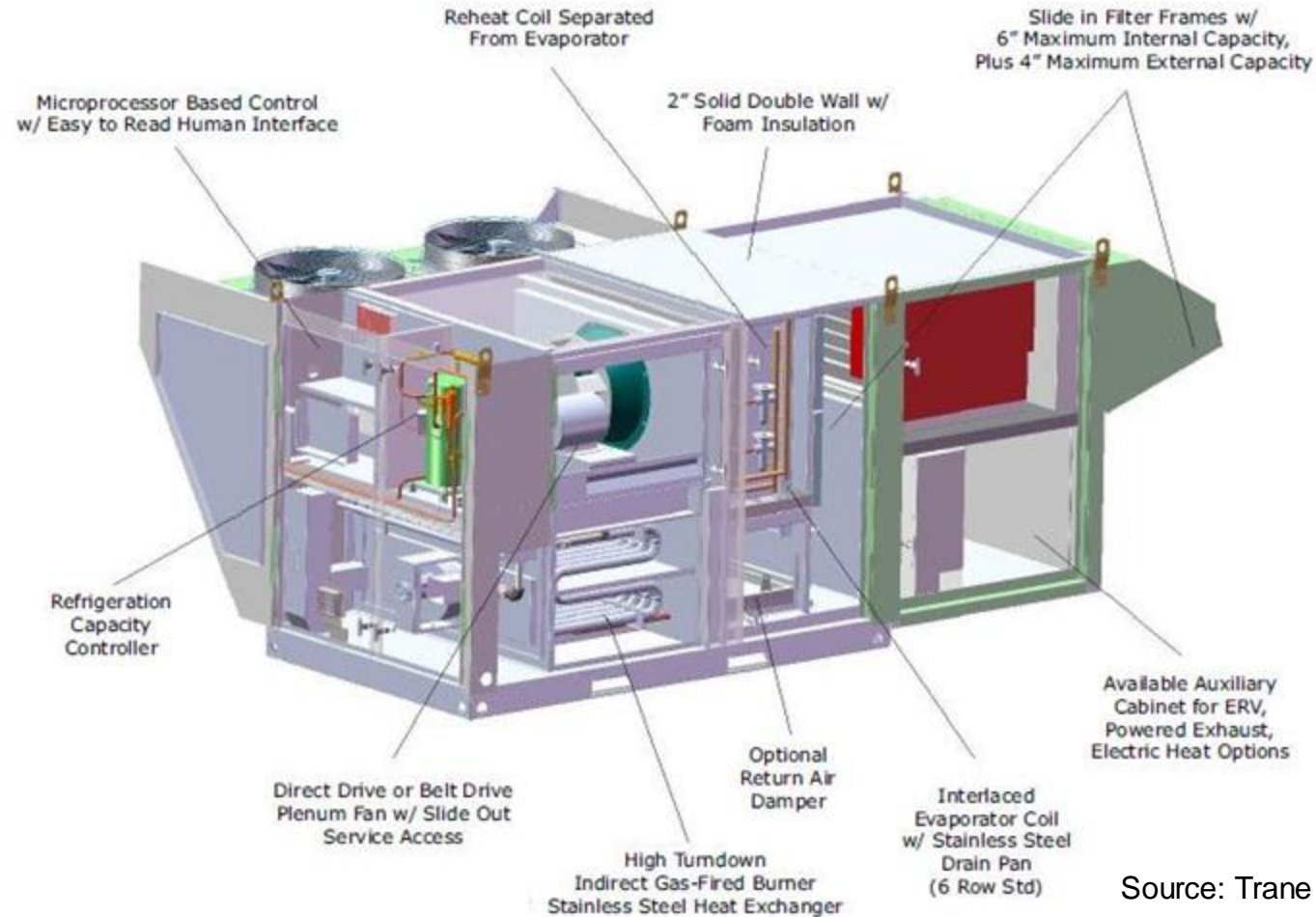
DISTRICT ENERGY SYSTEMS

Conventional Heating



DISTRICT ENERGY SYSTEMS

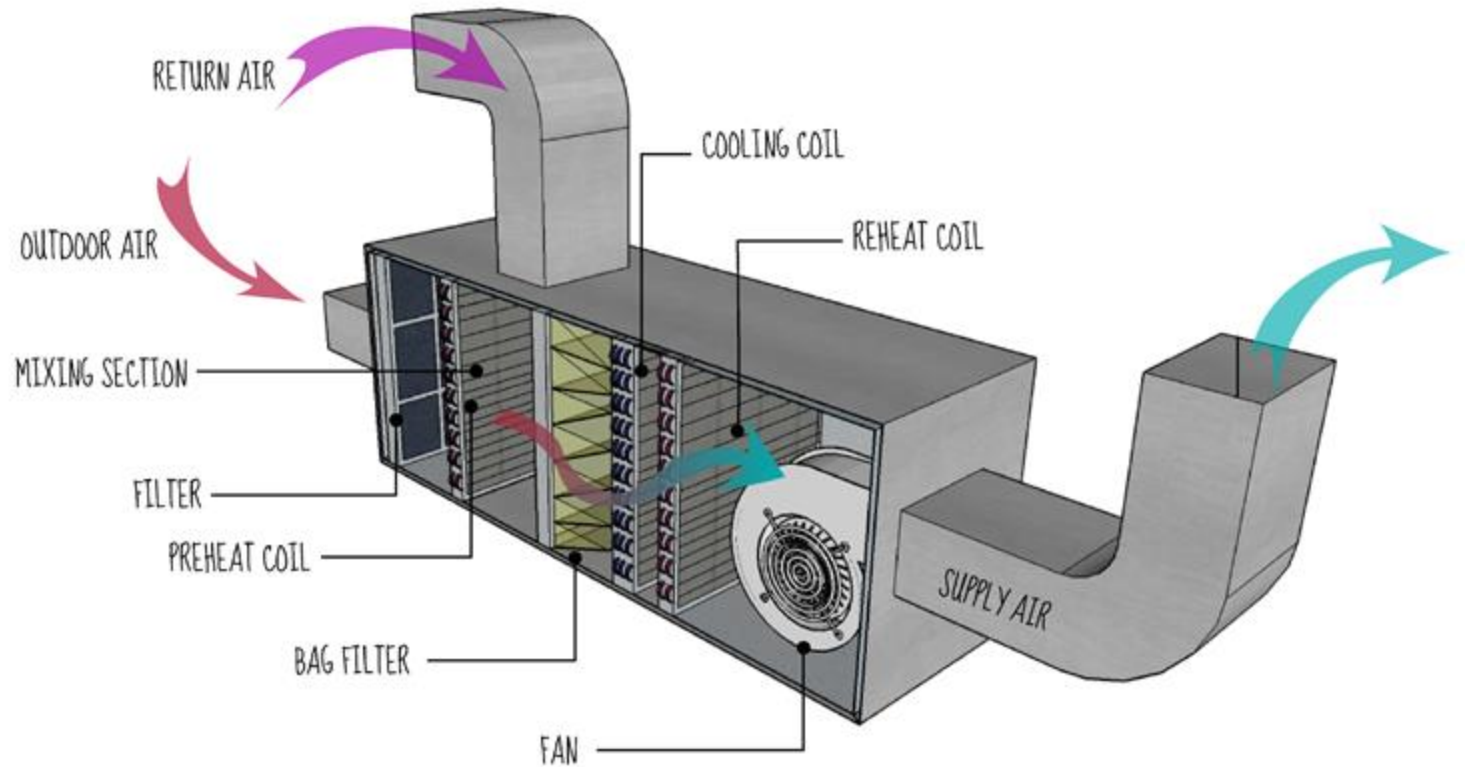
Conventional Heating



Source: Trane

DISTRICT ENERGY SYSTEMS

Conventional Heating







DISTRICT ENERGY SYSTEMS

Low-Temp Hydronic Heating



DISTRICT ENERGY SYSTEMS

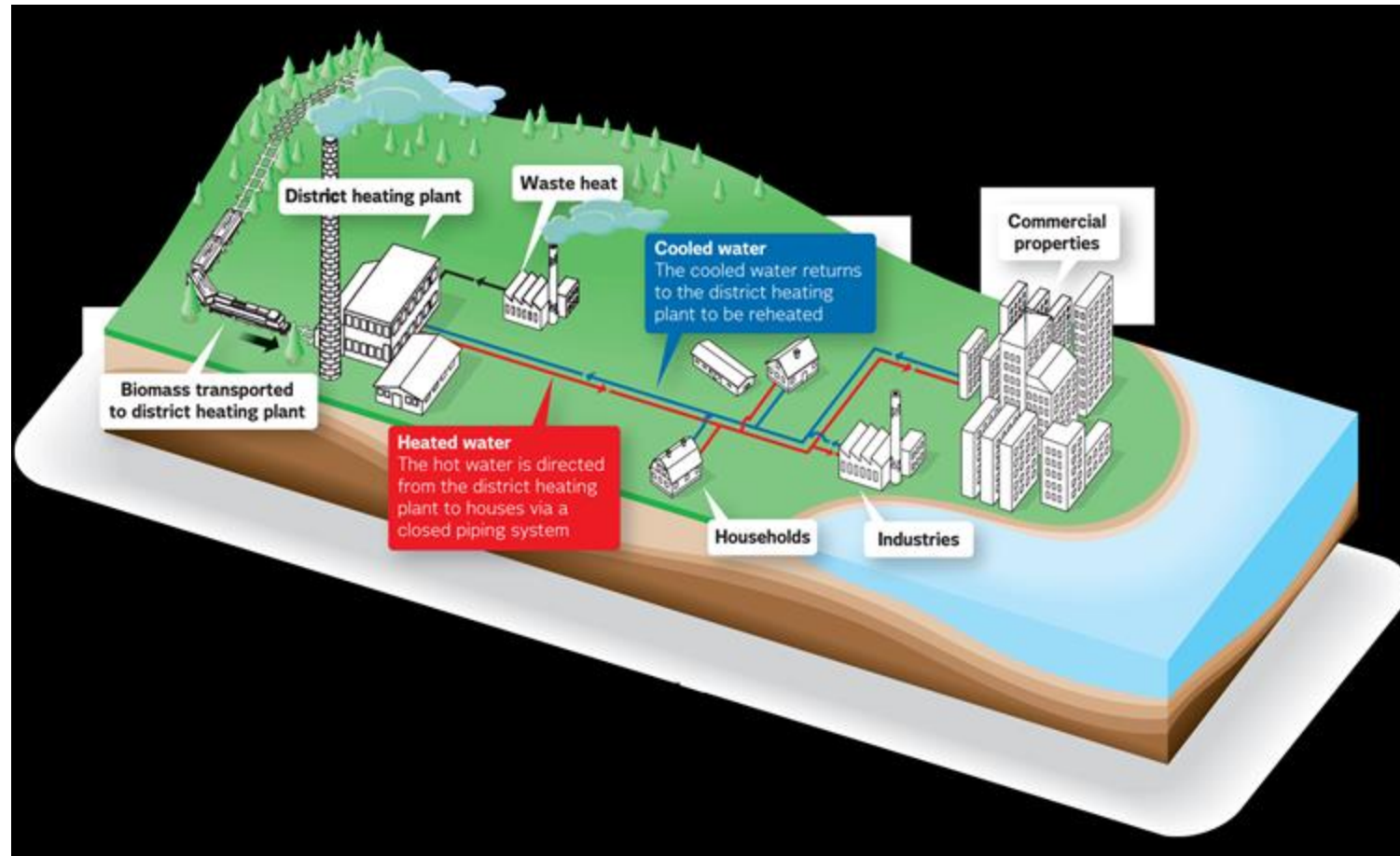
Sheridan Hazel McCallion Campus





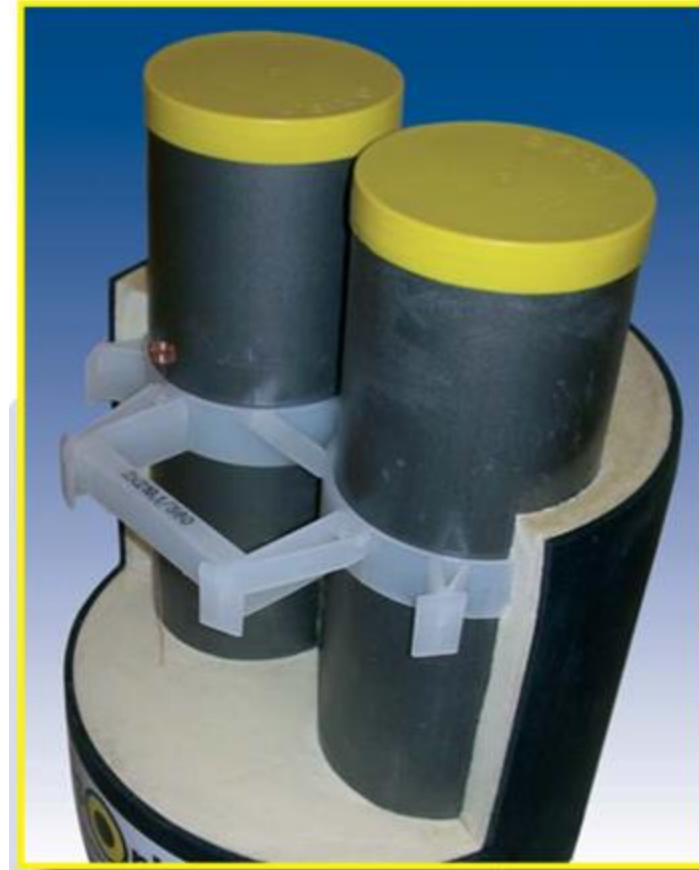
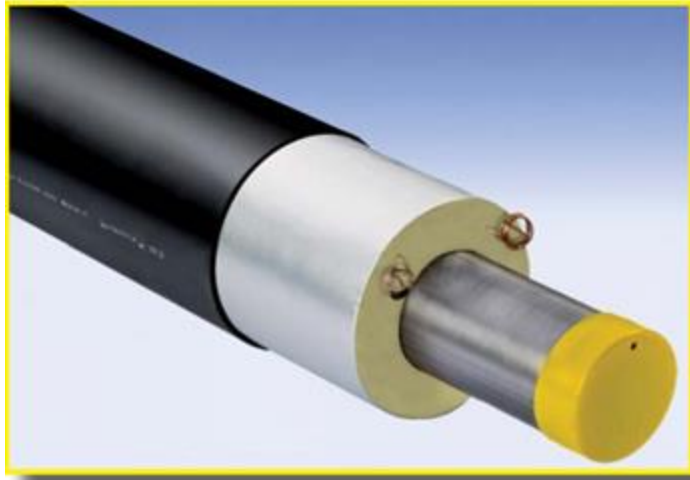
District Energy Systems

End-to-End System





Pre-Insulated Piping Systems (isoplus) *European Standard*



3G District Energy Networks

European Standard



DISTRICT ENERGY SYSTEMS

Pre-Insulated Pipe Systems



DISTRICT ENERGY SYSTEMS

Pre-Insulated Pipe Systems



Energy Distribution



DISTRICT ENERGY SYSTEMS

District Energy Architecture?



Energy Supply



Energy Supply



Building Service



Steam to Hot Water Conversion



Steam to Hot Water Conversion

Primary (District Energy) Side



Supply (82C/180F)



Return (52C/126F)

Secondary (Building) Side

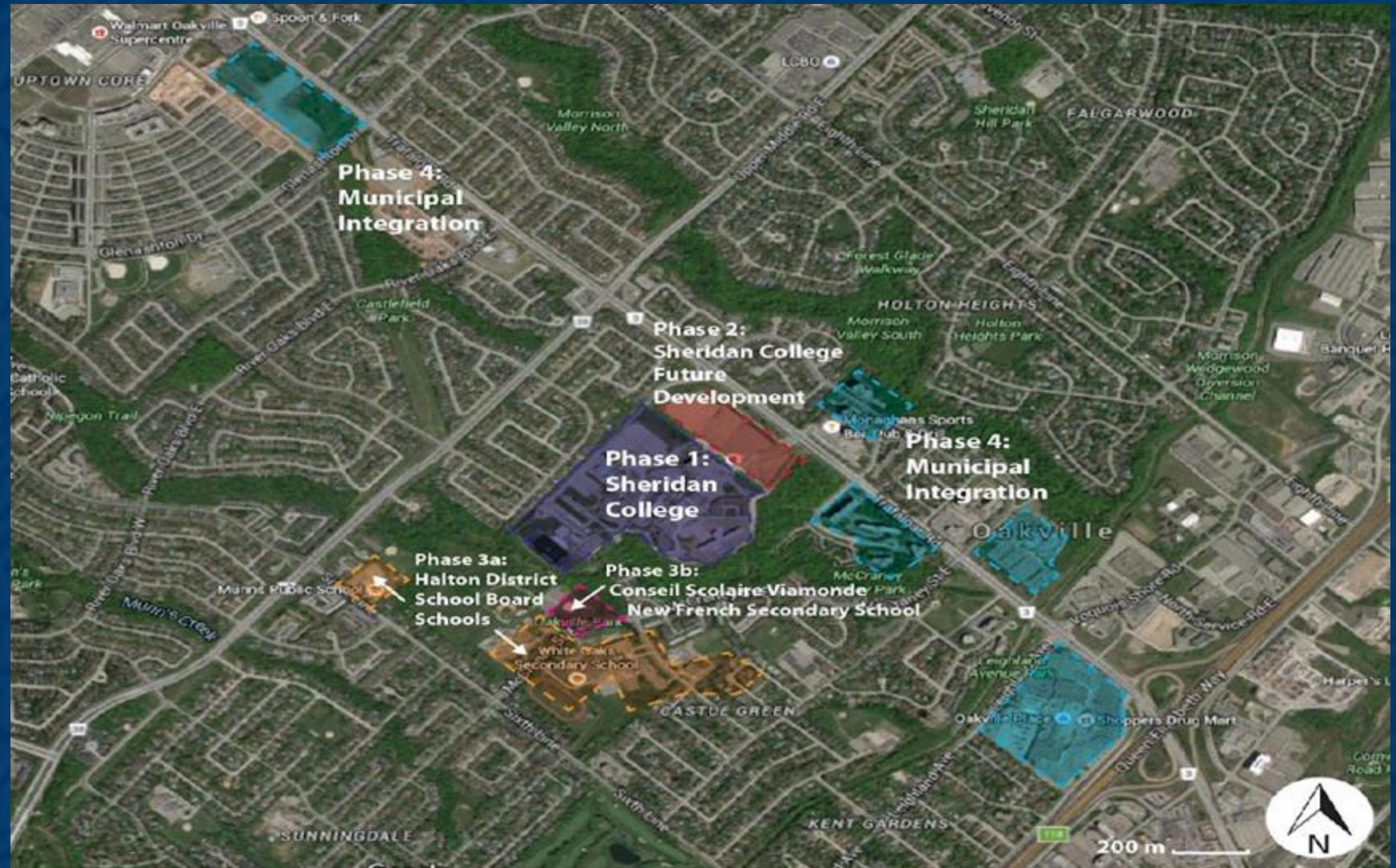


Supply (62C/144F)



Return (50C/122F)

Proposed Oakville District Energy Phasing



Town of Oakville working with Sheridan to tackle greenhouse gas emissions

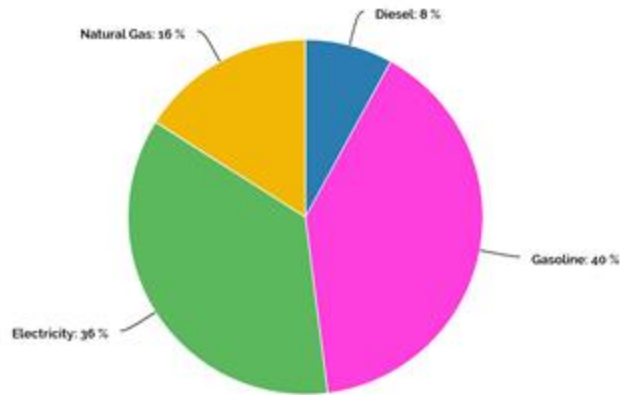
2 institutions working to create Community Energy Plan

NEWS Feb 20, 2018 Oakville Beaver

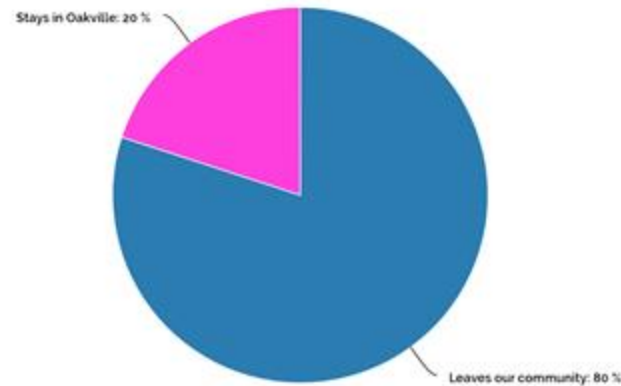
Oakville's Community Energy Plan

Did you know?

How much do we spend on energy in Oakville?



Per cent of money spent on energy



Total of \$620 million!

At least \$500 million leaves our community.

Oakville's Community Energy Plan will help the town, residents and businesses work together to reduce energy costs and greenhouse gas emissions while strengthening the local economy and building an affordable and reliable energy future.

Oakville's Community Energy Plan is being developed in partnership with:





LIVING THE MOSAIC

Brampton 2040 Vision
May 2018

future ready | BRAMPTON

Community Energy Plan Adds The Energy Layer

Community Energy Plan Goals

- Support “Brampton 2040 Vision”
- Environment – Support Federal Climate Goals
 - *Cut GHG emissions by 50% by 2041*
 - *Be on track to cut GHG by 80% from 1990 levels*
- Economic – Positive Economic Development
 - *Energy investments meet acceptable risk-adjusted returns*
 - *Energy costs will be competitive compared to comparable Canadian and US communities*
 - *Generate incremental high-quality employment*
- Energy Efficiency – Global Best Practice
 - *50% below 2016 level by 2041*
- Energy Reliability / Resilience / Flexibility
 - *Energy systems will meet the challenges of changing user expectations, climate uncertainty and new technologies*

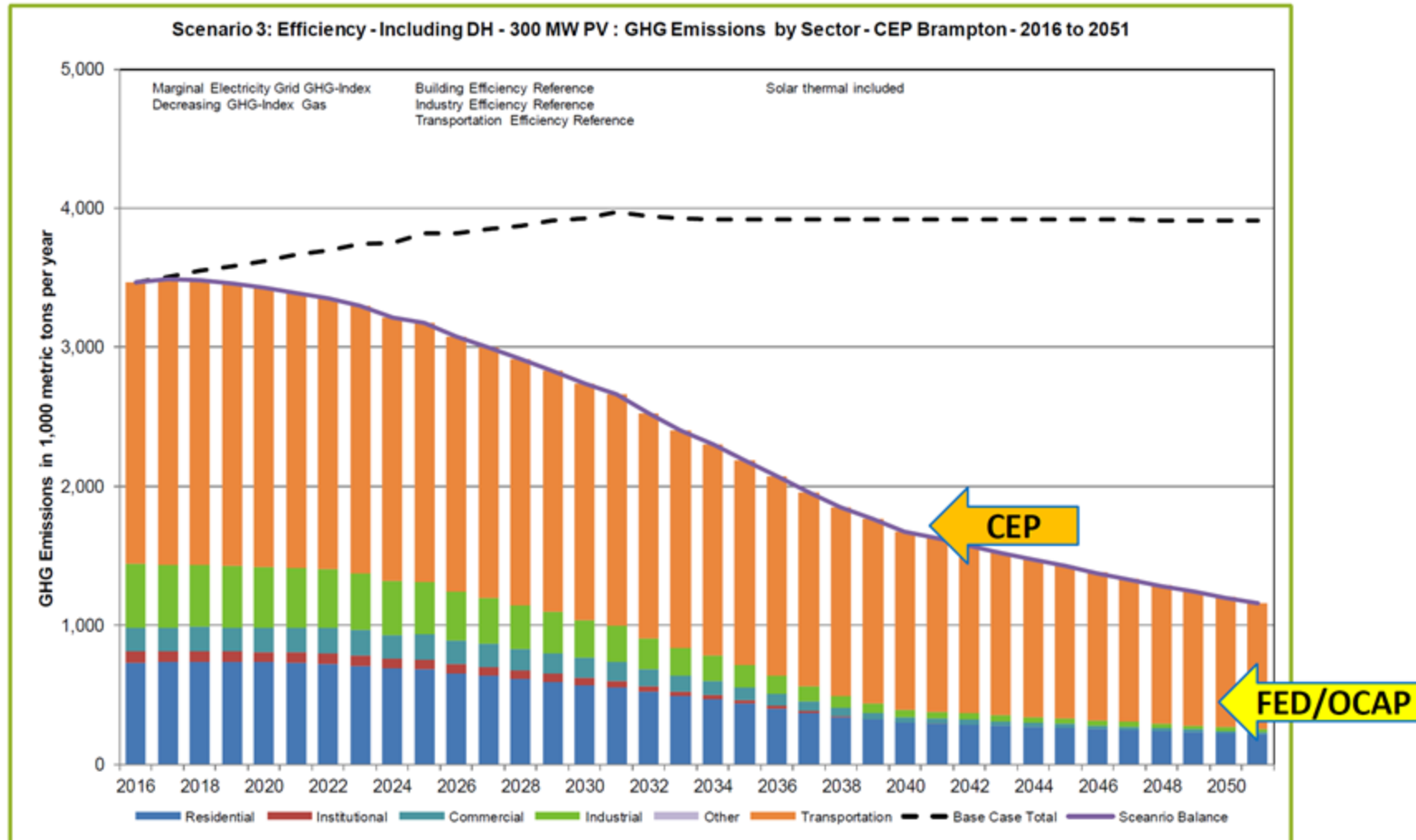
Developing Integrated CEP Scenarios

Simulation Elements

- Efficiency of new homes
- Efficiency of new C&I buildings
- Efficiency of existing homes
- Efficiency of existing C&I buildings
- Efficiency of industry
- District Energy Areas - Densification
- District Energy Areas – Greenfield Neighbourhoods
- Renewable solar heat generation
- Renewable electricity generation
- Transportation mix and efficiency
- Ontario grid generating mix
- Natural gas network source mix

Brampton Simulation – Reference Case

GHG Emissions by Sector



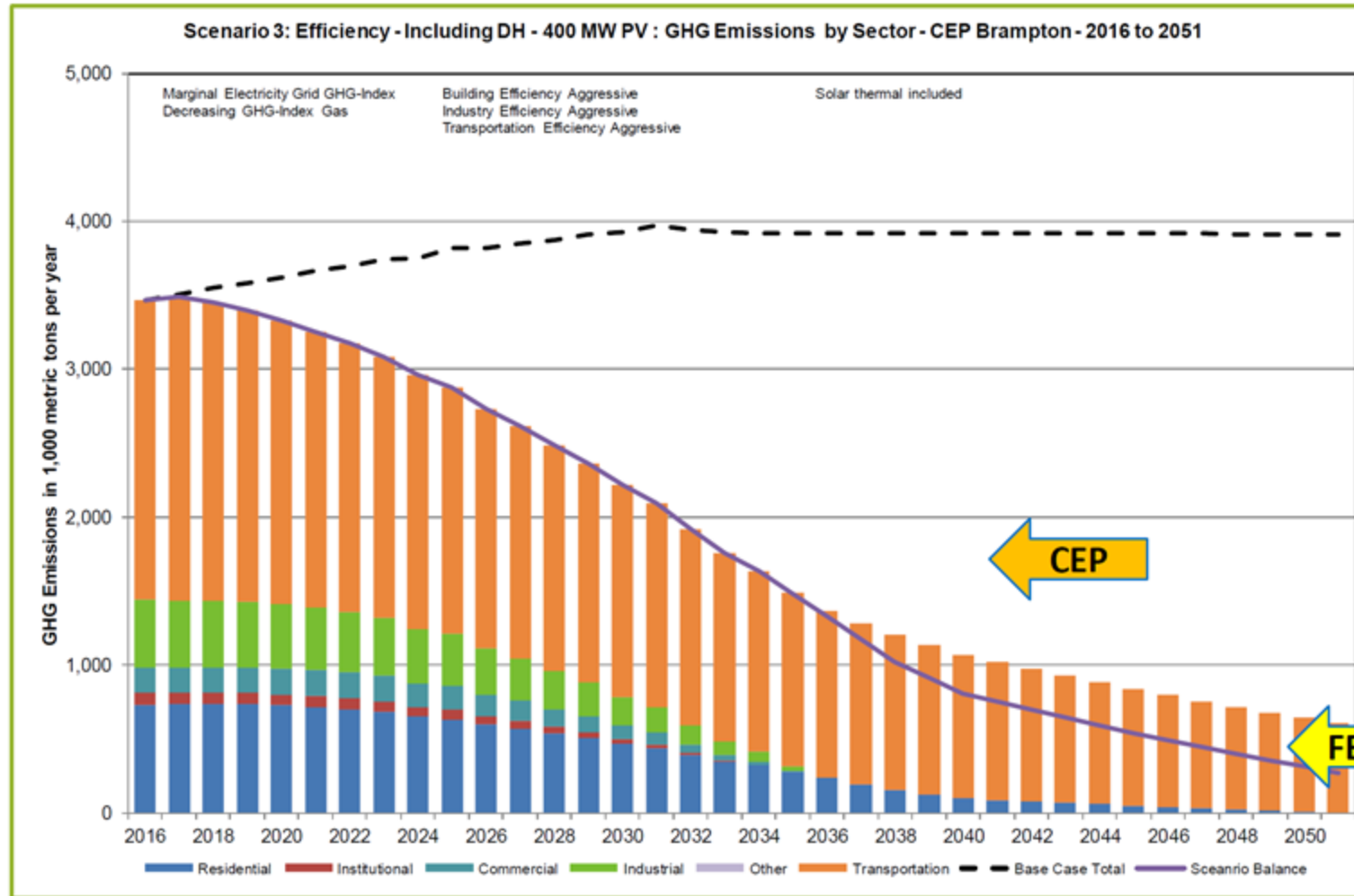
Brampton Simulation

Aggressive Case

- Existing Home & Building Efficiency
 - *Increase share of retrofits to 90% with 20% more efficient packages*
- New Home & Building Efficiency
 - *Encourage 5% efficiency above code*
- Industrial Efficiency
 - *Encourage all industry meet global-best practice of 1.5% per year*
- District Heating
 - *Increase market shares to near 100% and accelerate use of latest CHP technologies*
- Solar Thermal
 - *Double targeted share to 20%*
- Solar PV
 - *Increase total installed capacity to 400 MW*
- Transportation Energy
 - *Encourage double use of electric vehicles and mass transit*
 - *Design neighbourhoods and policy even more intensively to encourage walking cycling and LEVs*

Brampton Simulation – Aggressive Case

GHG Emissions by Sector

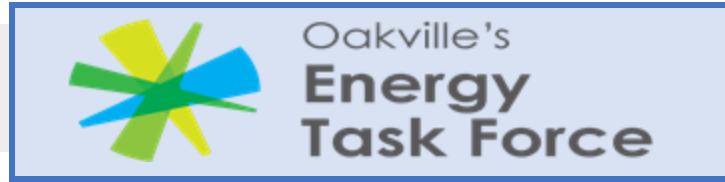


Brampton Simulation

Summary

- Simulation facilitates robust community discussion of measures and outcomes
- Informed by analysis not opinions
- Identified pathway to meet Community and Federal Targets
- Credible trajectory to “Net Zero” Emissions
- Represents complete transformation of energy use and supply for City
- Prerequisite to develop meaningful Final Community Energy Plan

Board of Directors



Implementation Management Office

Executive Director

Energy Efficiency Company Lead

Energy Master Plans Lead

Industrial efficiency Lead

District Energy Company Lead

Transport Lead

Municipal Policy Lead

Delivery Partners

TBD

TBD

TBD

TBD

Town

Town

Priority Projects

1 2
4 5

6
7

9

10
11

14

3 8
12 13

Thank You!

THINK

Evan Green, P.Eng., CEM, CMVP, CBCP
Manager, Engineering for Sustainable
Development

evan.green@sheridancollege.ca

Linked in.



HCE Presentation



Connecting to a better future, today.

Thermal Energy & Energy
Harvesting as a Pathway to
Net-Zero

Jeffrey Cowan - jeff.cowan@hce.net
Josh Fitzpatrick - jfitzpatrick@hce.net





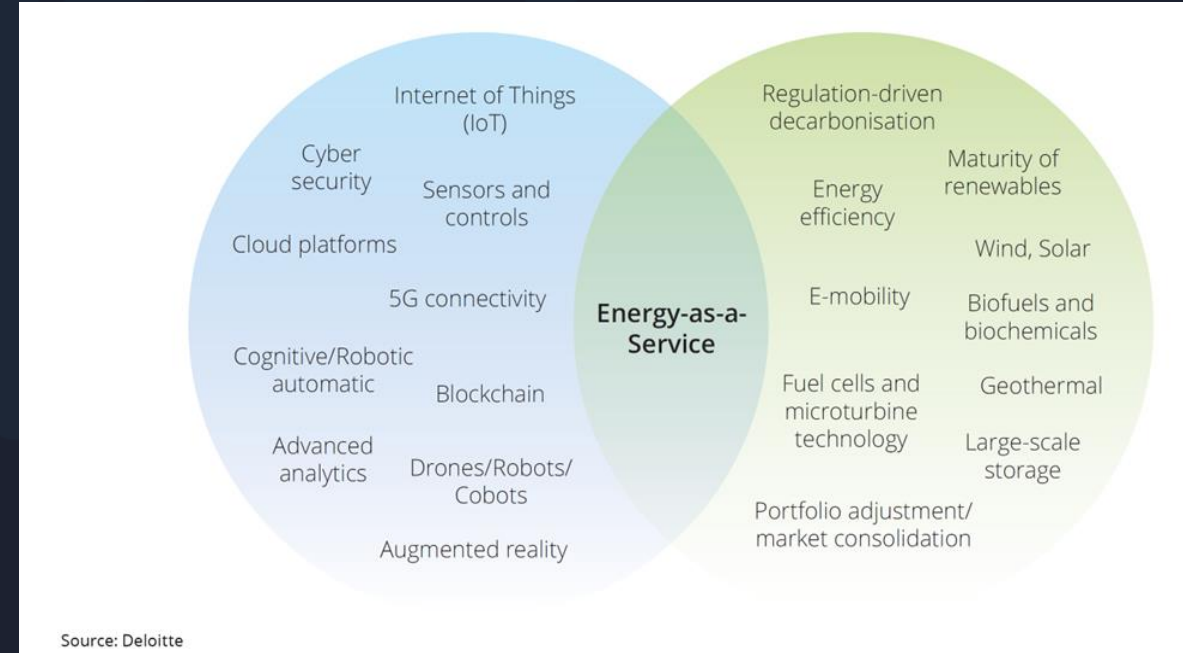
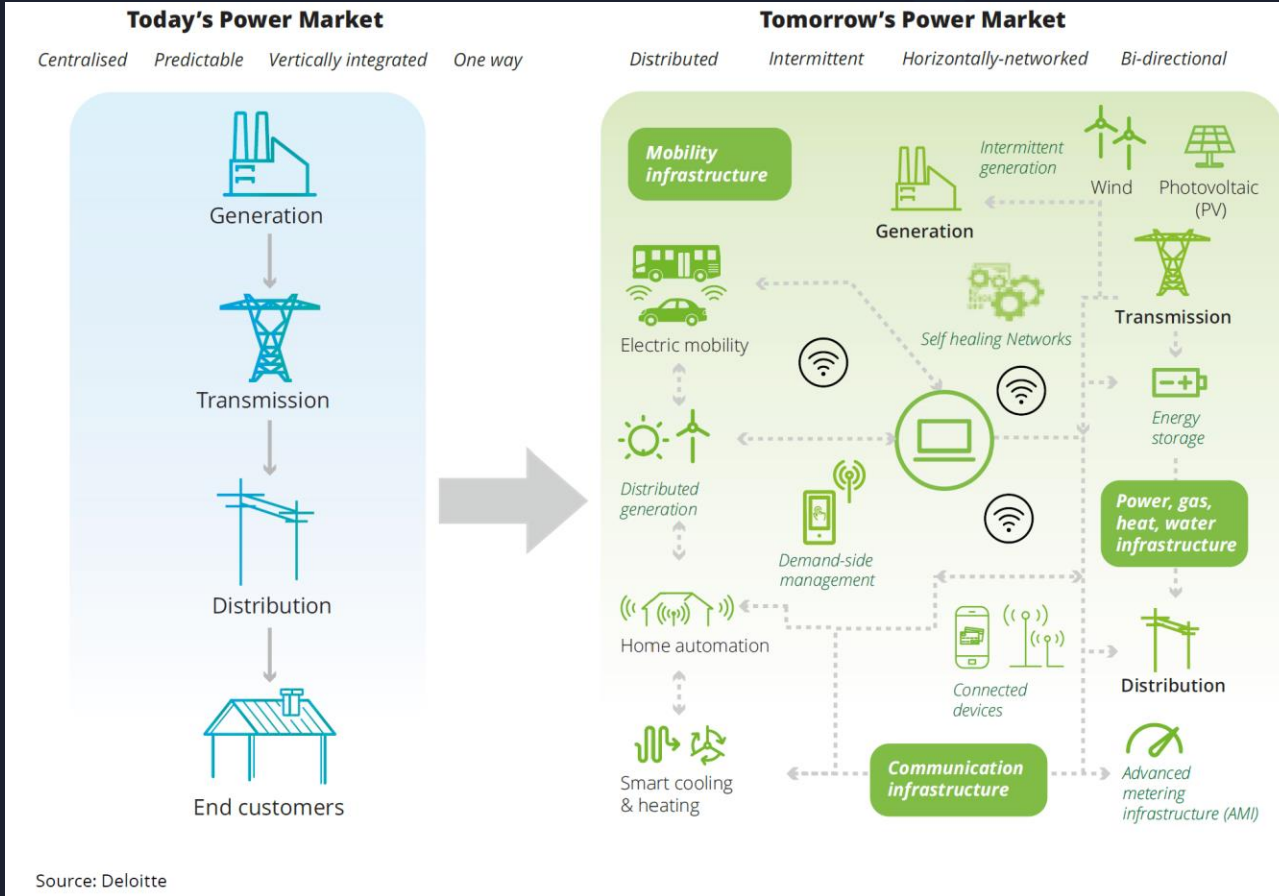
The Drive to Net-Zero Crisis Drives Change

- ❑ Post Pandemic Expansion / Inflation
- ❑ Energy and Technology Disruption
- ❑ Climate Change
- ❑ Canada's 2030 Emissions Reduction Plan Tabled in Parliament
 - Targets 40% to 45% reduction below 2005 levels by 2030 and Net-Zero by 2050
 - A minimum reduction of 283 Mt is required to meet 2030 Target
 - Only 9 Mt were achieved in the period 2005 to 2019 (14 years)





The Evolving Energy Landscape

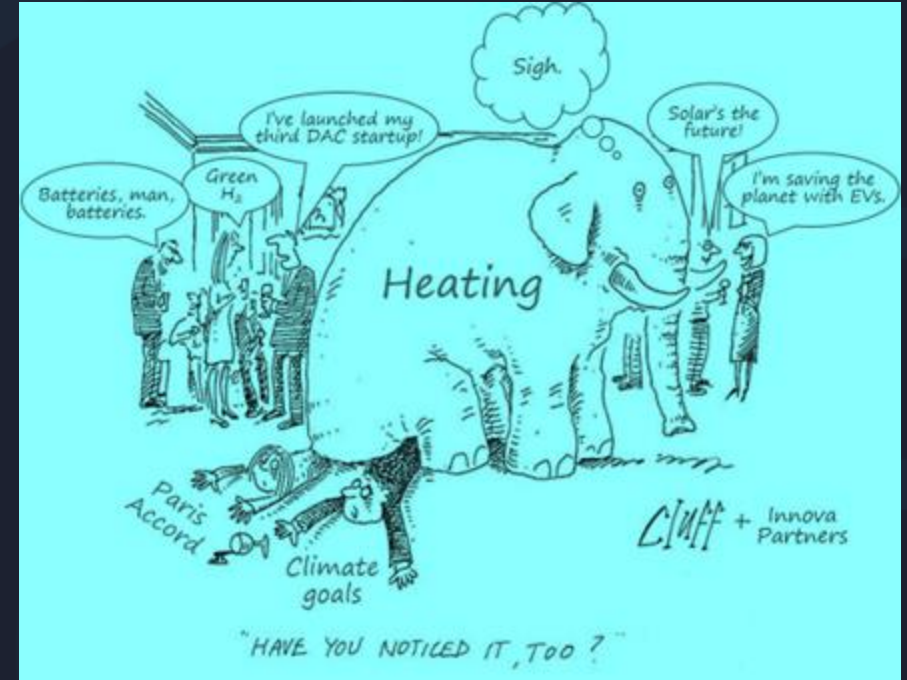
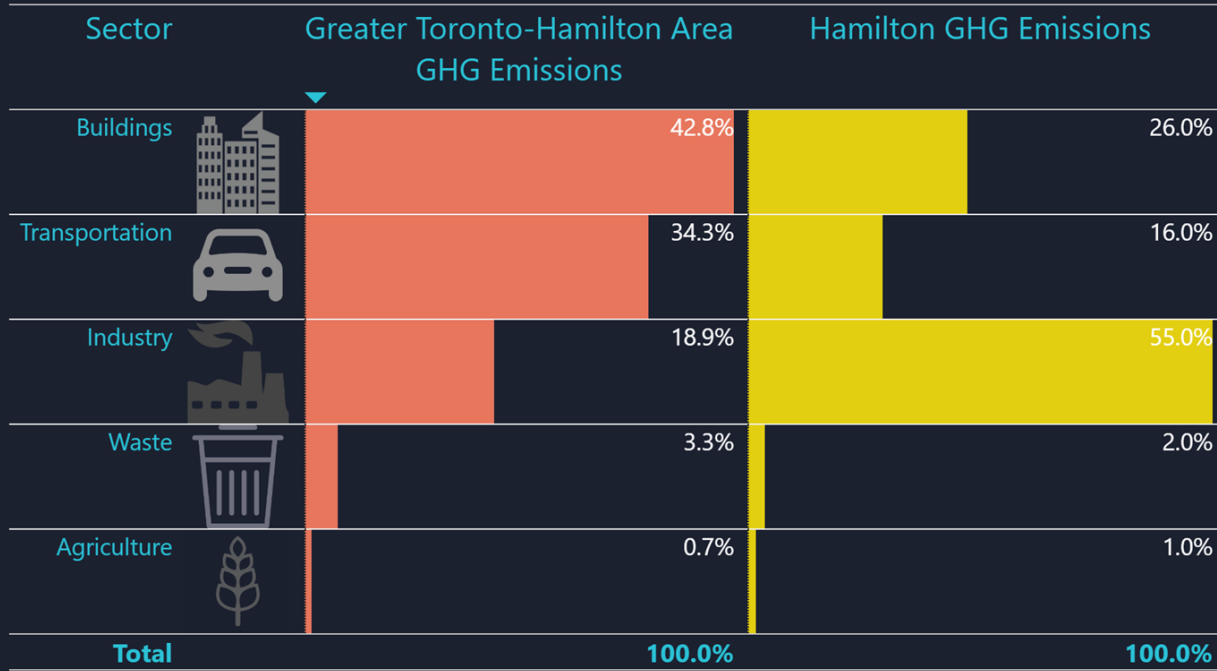


HCE is uniquely positioned to benefit from this transformation occurring in the energy sector

- Municipal Ownership
- Utility roots (Energy + Telecom)
- Niche agile business



Building Heating Must Be Addressed to Lower GHGs



Challenge for Hamilton

- ❑ Tackle GHG emissions from Industry and not simply see a rebalance of GHG emissions from Buildings and Transportation



The 3 C Pathway to Net-Zero Carbon

CONSERVE

*Reduce the
Demand for
Energy*

*Use Energy
Effectively*

CONNECT

*Integrated
Energy
Networks*

CONVERT

*Eliminate
Fossil Fuel
Source*



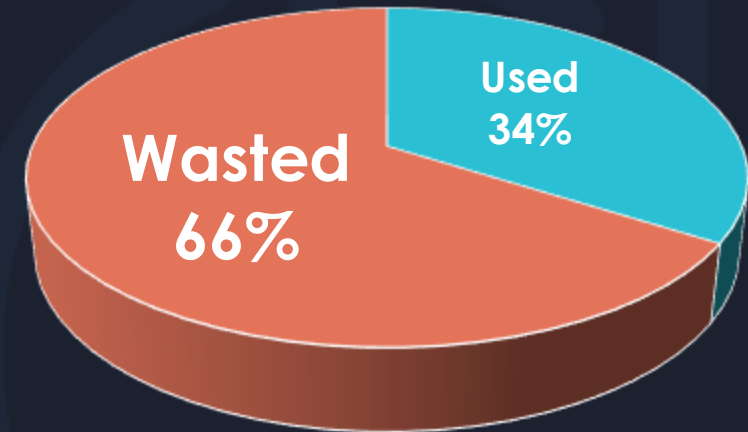
Conserve

Conservation and Optimization

Get the most out of every unit of Energy

- Conservation
 - Use less
- Increase Efficiency
 - High-efficiency Heating – gas & electric
 - Heat Pumps for Cooling
- Energy Sharing / Harvesting
 - Cooling as a source of heating
 - Industrial Residual Heat
- Seasonal Storage
 - Heat harvested in summer stored for winter use

Canadian Energy Utilization

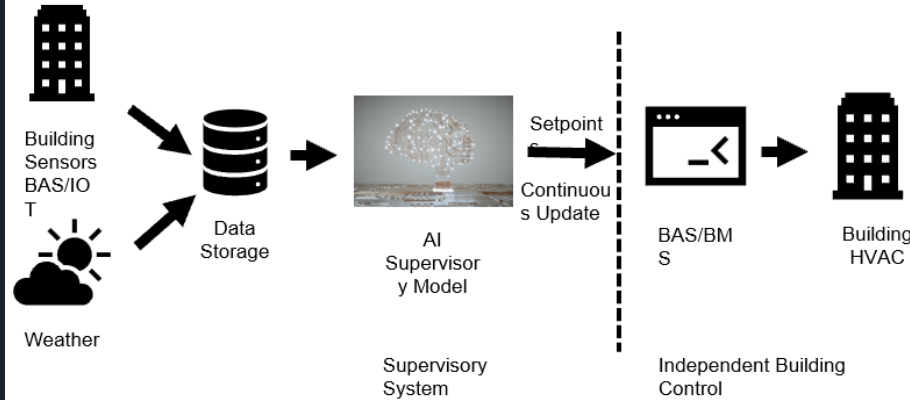


Source: Canadian Energy Systems Analysis Research – Ontario's 2013 Energy Systems



Conserve - Downtown District Energy Network

20% GHG Reduction Through Demand Side Management



Building Requirements:

- Construction – Building needs thermal mass
- Size – better as building size increases
- BAS/BMS Controls
- Zoned HVAC with VFD Drives
- Periodic occupation (not 24hr)
- Inside temperature can vary over 24 hr period
- More savings for heating and cooling

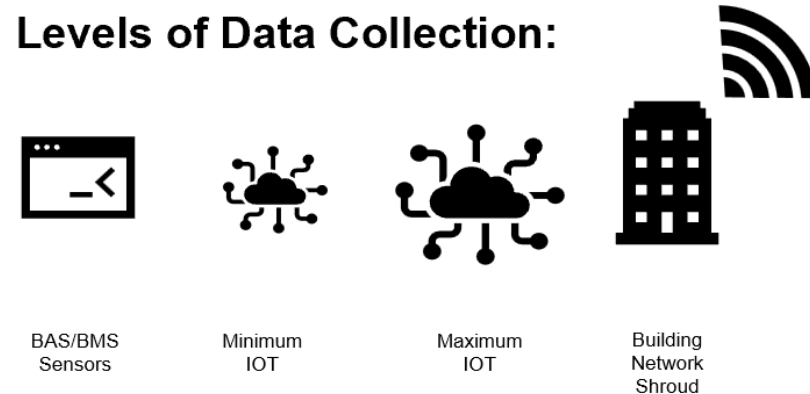
Benefits:

- Energy Savings – 15% to 20%
- Decreased carbon footprint
- Increased occupant comfort
- Energy dashboard output
- Fail-safe independent BAS/BMS operation

How:

- Considers thermal mass of Building
- Occupancy of Building
- Weather predictions used
- Employs variable price of energy (if available)

Levels of Data Collection:



Increased Control Capability / Benefits



Connect

The Building Heating Opportunity



Energy Sharing

Making the most of every joule

- Maximize utility of Energy
- Utilize heat from cooling
- Use industrial residual heat
- Minimize waste



High Temperature (100C)

Hot Water Network

- Supplement to existing hot water heating systems
- Absorption cooling heat source



Low Temperature (30C)

Warm Water Network

- Supplement to new medium temperature hot water systems with heat pumps
- Alternative to geo-exchange



Connect

Integrated Energy Networks

□ Highway for energy – able to fuel switch – **future proof**

□ No technological challenges

- Great distances can be served (> 50 km)
- Large markets can be serviced
- Data / Digitization transforms solution to 21st Century
- Biggest challenge will be resourcing talent

□ Lower cost to decarbonize

□ Integrated electrical, data and thermal networks

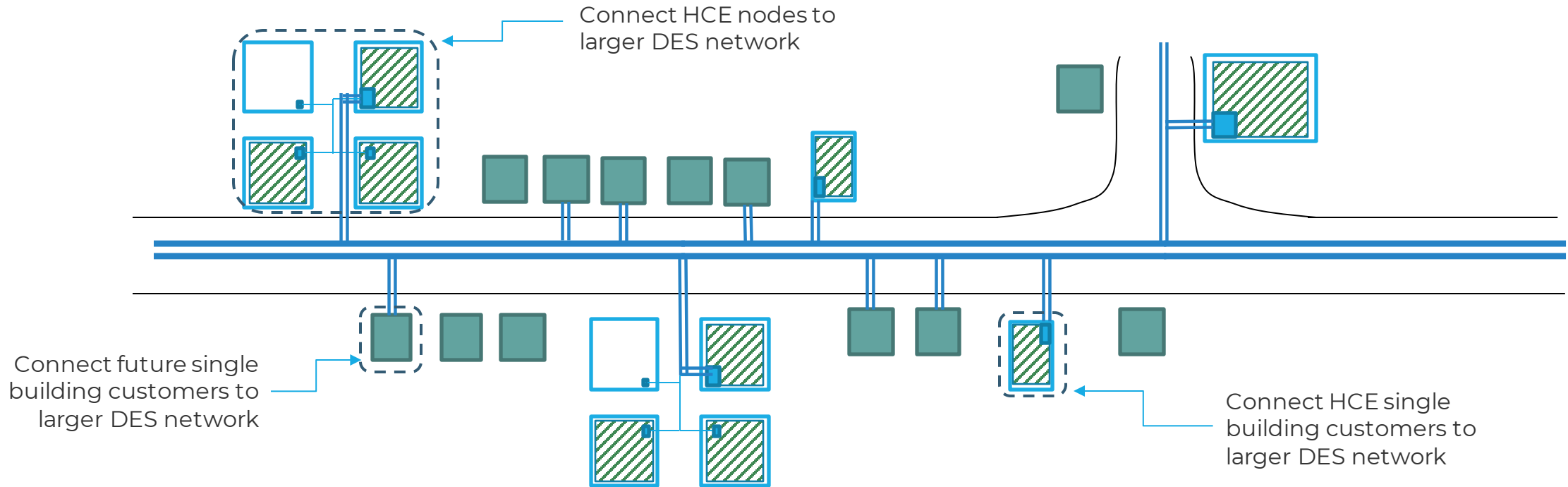
□ **Complementary – use electricity where best suited – not universally**





Connect

Future of District Energy in Downtown Hamilton A low-carbon Energy Approach to Growth



- Interim viable business model to support District Energy node development
- Over time the aggregate load supports interconnection
- Provides built in demands for Bayfront Heat recovery, supporting the business case
- Long-term strategy can be realized more effectively if buildings become DES connection ready in the short and medium terms
- Densification will positively contribute to this strategy in the long term

This is not a departure from HCE's current Business Model. It is an evolution to enable long-term strategic growth.



Connect

Provide premise-based, low-carbon and renewable high-efficiency building heating and cooling

Focus On:

- Energy as a Service – agnostic to Low Carbon Technology
- New Construction greater than 40,000 sf (competitive)
- Not Geographically constrained
- Buildings/Customers come first – networks follow
- Discrete Buildings >>> Campus Systems >>> District Systems >>> Industrial Residual Heat
- Low Carbon transition path from today



Convert Get the Most Out of Every Joule

2018 Hamilton Chamber of Commerce Study

Challenge: Reduce GHG emissions in Canada's Industrial Heartland

Strategy: Engage businesses and industries to develop and implement solutions

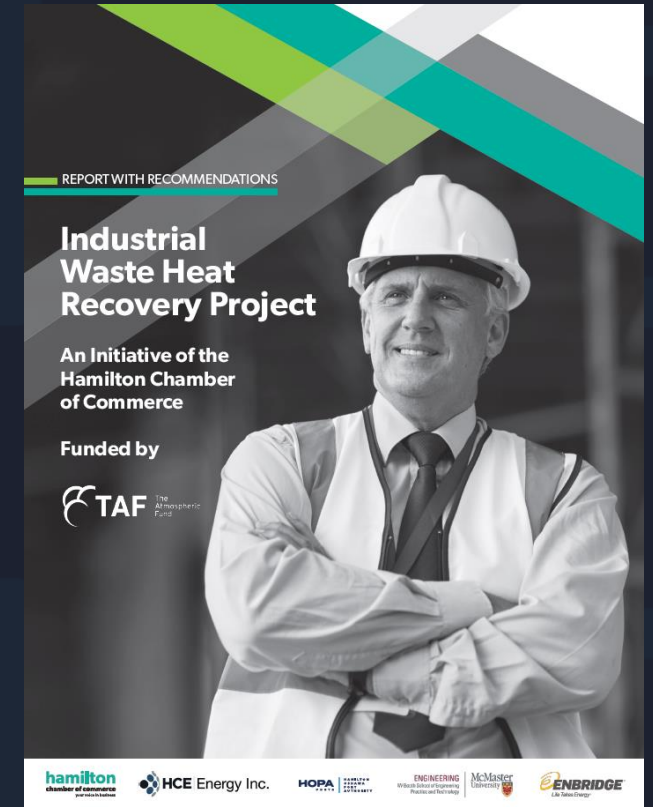
Opportunity: Unlock additional value from Hamilton's Bayfront



Industrial Residual Heat is approximately **4 million GJ/yr.**, enough to heat roughly **45,000** homes or **80,000,000 sq ft** for a year



Results in a carbon offset of approximately **200,000 tCO₂eq/yr.**





Convert

The Value of Industrial Residual Heat

Swedish Example

- ❑ Oresundskraft, the local Energy Supplier for Helsingborg, supplies almost 100% renewable low-carbon heat to homes over a 70 km integrated energy network
- ❑ 50% of Swedish home-owners are connected to District Energy
- ❑ 35% of Helsingborg's thermal energy comes from a local plant of a global chemical producer - Kemira
- ❑ **Kemira has been supplying heat to Oresundskraft for over 40 years and credits this revenue stream for keeping the plant there and keeping it competitive**



Energy Harvesting Feasibility Study

HCE's Vision to Decarbonize Building Heating

- HCE has launched a year-long study that will dive into the technical feasibility and commercial viability of harvesting residual thermal energy from Hamilton's Industrial Bayfront as a source to heat all types of buildings, new and old
- The Study is funded by a public-private sector group that includes ArcelorMittal Dofasco, Enbridge Gas, Federation of Canadian Municipalities, Hamilton Community Enterprises, Hamilton-Oshawa Port Authority, Slate Asset Management, and The Atmospheric Fund.



STUDY CONTRIBUTORS

STUDY LEAD

 **HAMILTON COMMUNITY ENTERPRISES**

MAJOR FUNDERS

 **TAF**

PARTNERS

OUTREACH AND ENGAGEMENT

 **hamilton chamber of commerce**
your voice in business

INDUSTRY

 **ArcelorMittal DOFASCO | HAMILTON**  **ENBRIDGE** Life Takes Energy  **HOPA** HAMILTON OSHAWA PORT AUTHORITY  **SLATE**

SUPPORTERS

 **Hamilton**  **ENGINEERING W Booth School of Engineering Practice and Technology**  **McMaster University**  **MOHAWK IDEAWORKS**  **HAMILTON INDUSTRIAL ENVIRONMENTAL ASSOCIATION**

 **NEW HORIZON**  **Air Liquide**  **RATHCO ENG**  **URBAN EQUATION**



Convert

Energy Harvesting Project Principles

What does Project Success mean to Hamilton's Stakeholders?

- Energy Distribution System needs to be an **Independent Commercially Viable Business**
- Business Case** for residual heat collection and use
- Value Received** for Residual Heat supply - \$\$, Carbon Credits, Cold Water, Energy
- Complementary** and **Incremental** to present efforts
- Sustainable** Enterprise



Convert

Energy Harvesting Feasibility Study

Broad-Based Involvement

- Hamilton Chamber of Commerce
- Professional Consultancies – Technical and Business
- Mohawk College
- McMaster University
- Suppliers
- Consumers
- Hamilton Decarbonization Hub



Convert

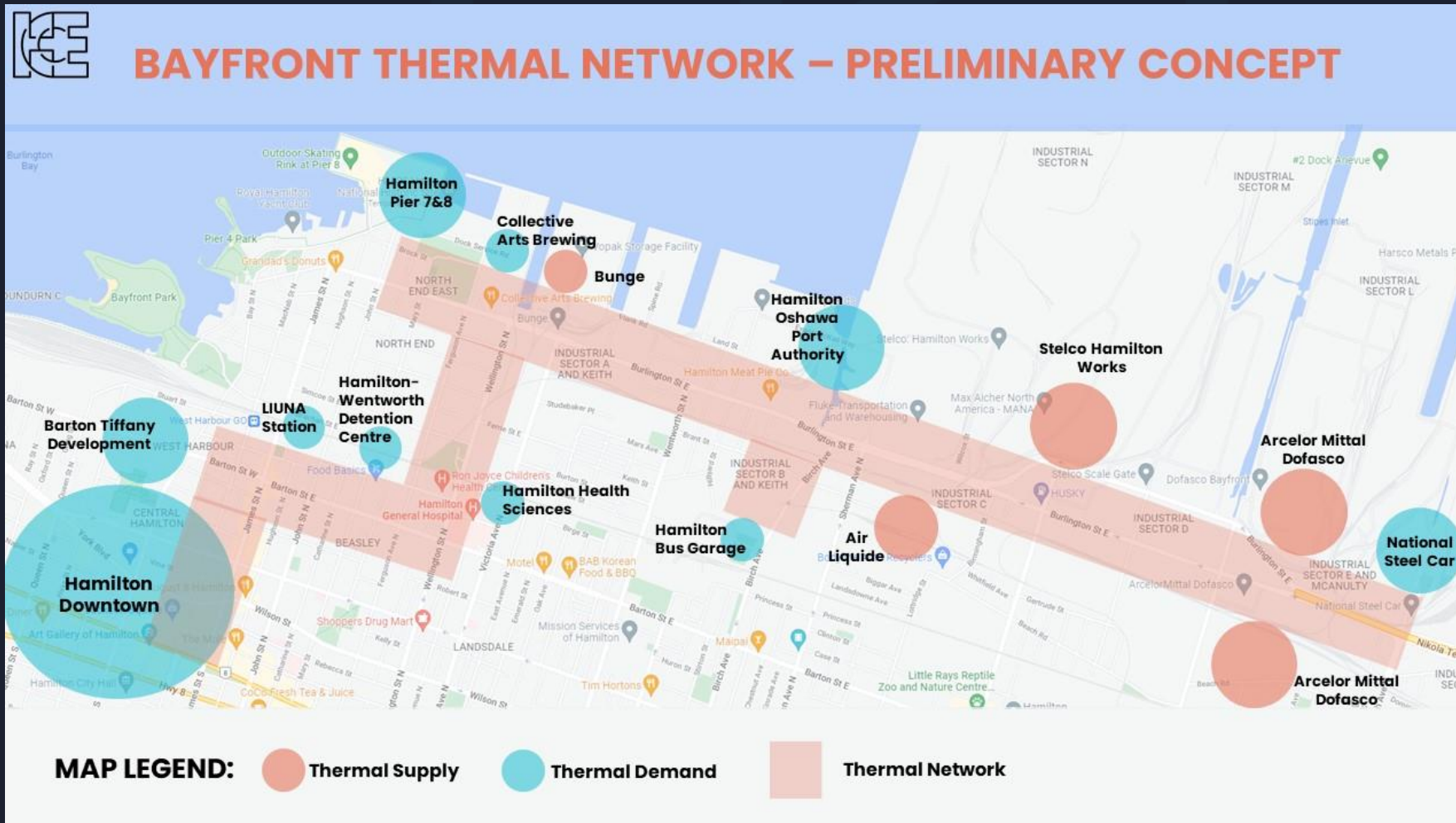
Energy Harvesting Feasibility Study Funding Partners

Funding Partners in Study

- HCE  HAMILTON
COMMUNITY
ENTERPRISES
- Enbridge Gas  ENBRIDGE
- ArcelorMittal Dofasco  ArcelorMittal
- Hamilton Oshawa Port Authority  HOPA
PORTS | HAMILTON
OSHAWA
PORT
AUTHORITY
- The Atmospheric Fund  TAF
- Federation of Canadian Municipalities  FCM
FÉDÉRATION
CANADIENNE DES
MUNICIPALITÉS | FEDERATION
OF CANADIAN
MUNICIPALITIES



Convert The Building Heating Opportunity





Covert

Energy Harvesting Feasibility Study

Benefits of Study

- Action on the decarbonization of Building Heating
- Aligns with a phased transition to renewable energy sources.
- Market for Industrial Residual Heat developed
- Supports the role of local industry in Hamilton
- Complements current efforts
- Hamilton Decarbonization Hub

Decarbonization / Circular Economy / Energy Equity and Security



Get the Most Out of Every Joule

2022 Study by HCE and McMaster Institute of Energy Studies (MIES)

Challenge: Reduce GHG emissions of DES at McMaster Innovation Park (MIP)



Strategy: Implement MIES's Patented ICE-Harvest Methodology at MIP



Opportunity: Reduce GHG emissions using only existing equipment



**How to reduce GHG emissions
by over 90% – with existing
equipment and distribution systems**

New research from McMaster Innovation Park in Ontario

By Joshua Fitzpatrick

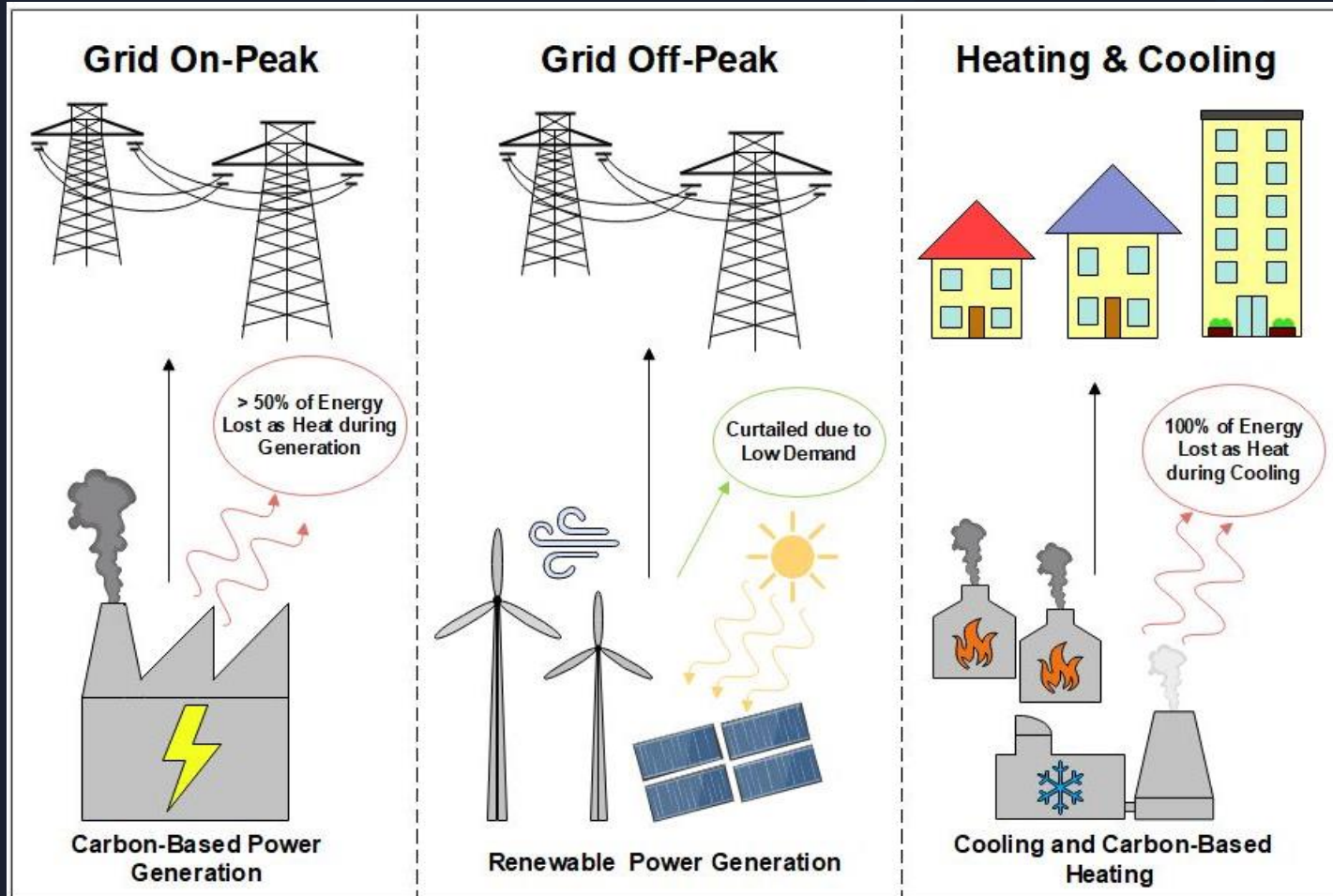


McMaster Innovation Park



Get the Most Out of Every Joule

Lessons Learned



- ❑ During on-peak times, natural gas power plants are dispatched, and Ontario's grid becomes carbon intensive.
- ❑ More than 50% of the energy is lost as heat from these power plants.
- ❑ During off-peak times, demand is so low that renewable sources must shut down.
- ❑ Buildings are heated with natural gas and cooled by electric chillers.
- ❑ All thermal energy rejected by chillers is lost through cooling towers.



Application

ICE-Harvest Methodology

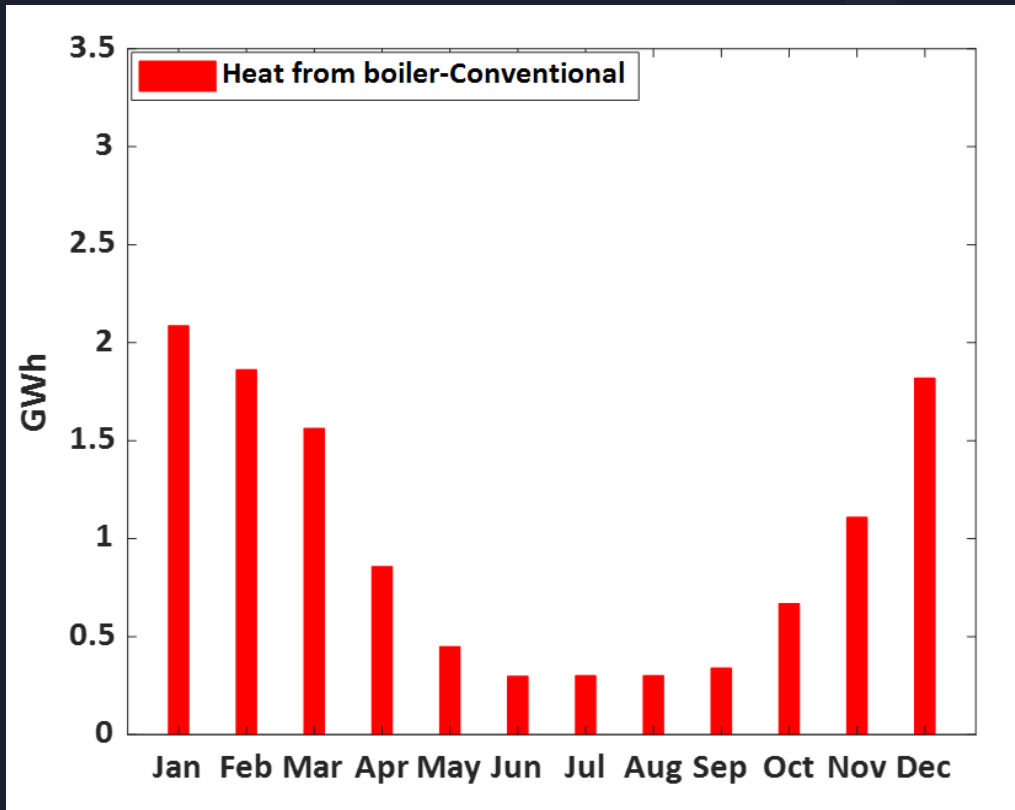
Integrated Community Energy & Harvesting (ICE-Harvest) Methodology:

- ❑ Integrates thermal and electrical energy systems, improves energy utilization & reduces GHG emissions
- ❑ Fuel switches in real-time based on the electricity grid
- ❑ During peak periods, on-site cogeneration produces electricity and heat, displacing only carbon-based grid power
- ❑ During curtailment periods, renewable grid power is used by on-site heat pumps to harvest heat from cooling processes
- ❑ Short-term and seasonal thermal storage bridge gaps between demand and supply of heat

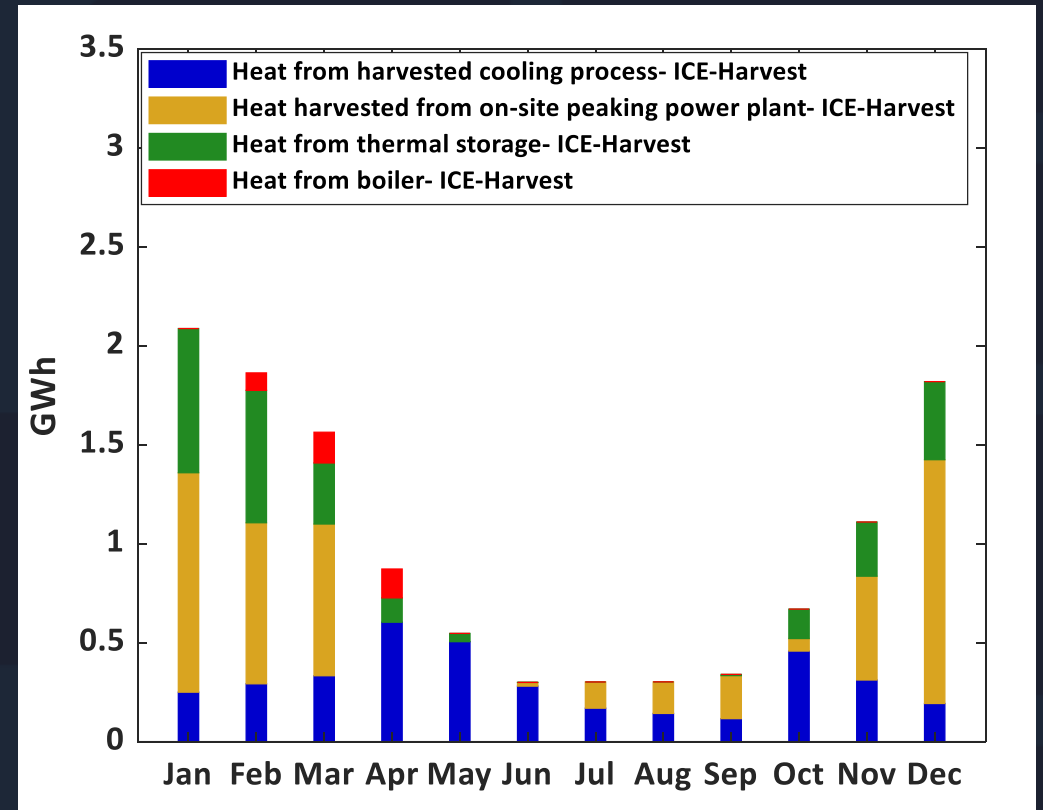


Application ICE-Harvest Methodology

Conventional Boiler



ICE-Harvest

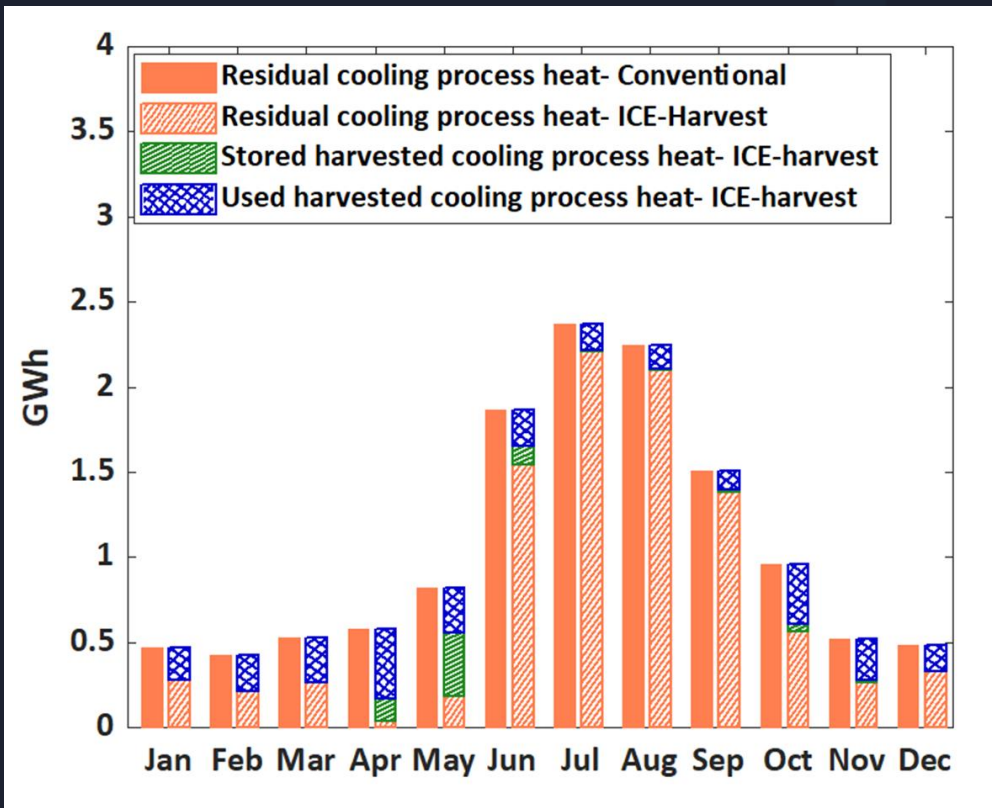


□ The ICE-Harvest system reduces the heat from boilers by over 96%

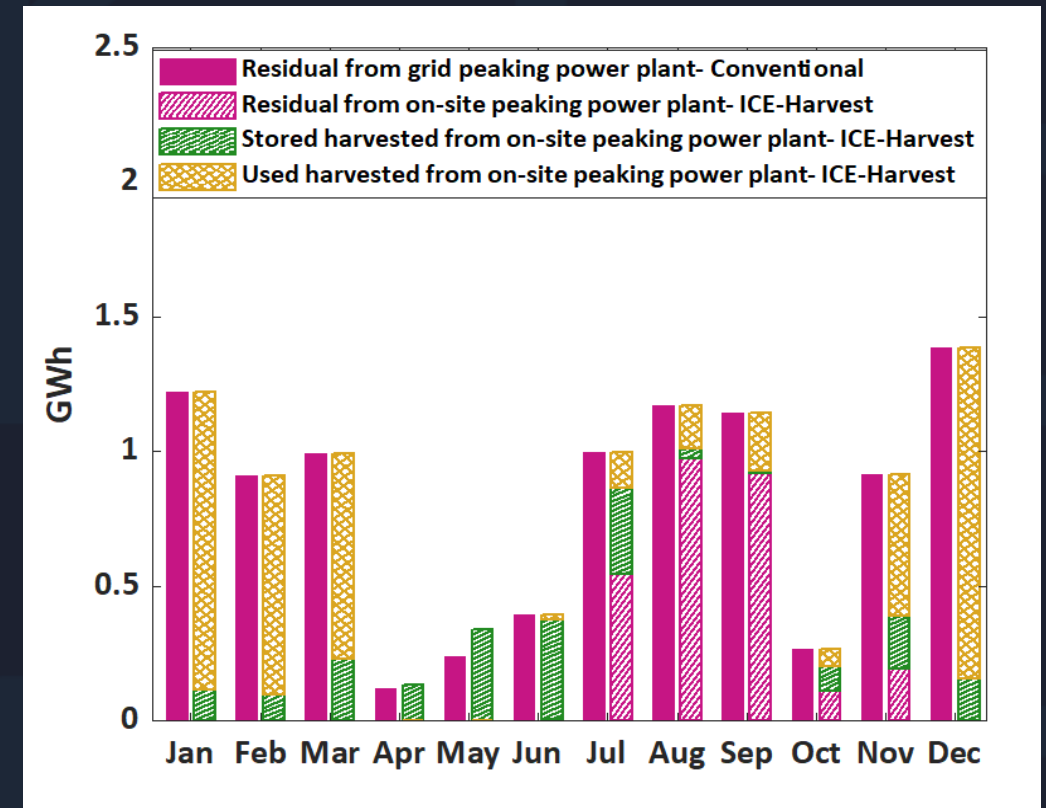


Application ICE-Harvest Methodology

Cooling Process Heat



Power Plant Heat

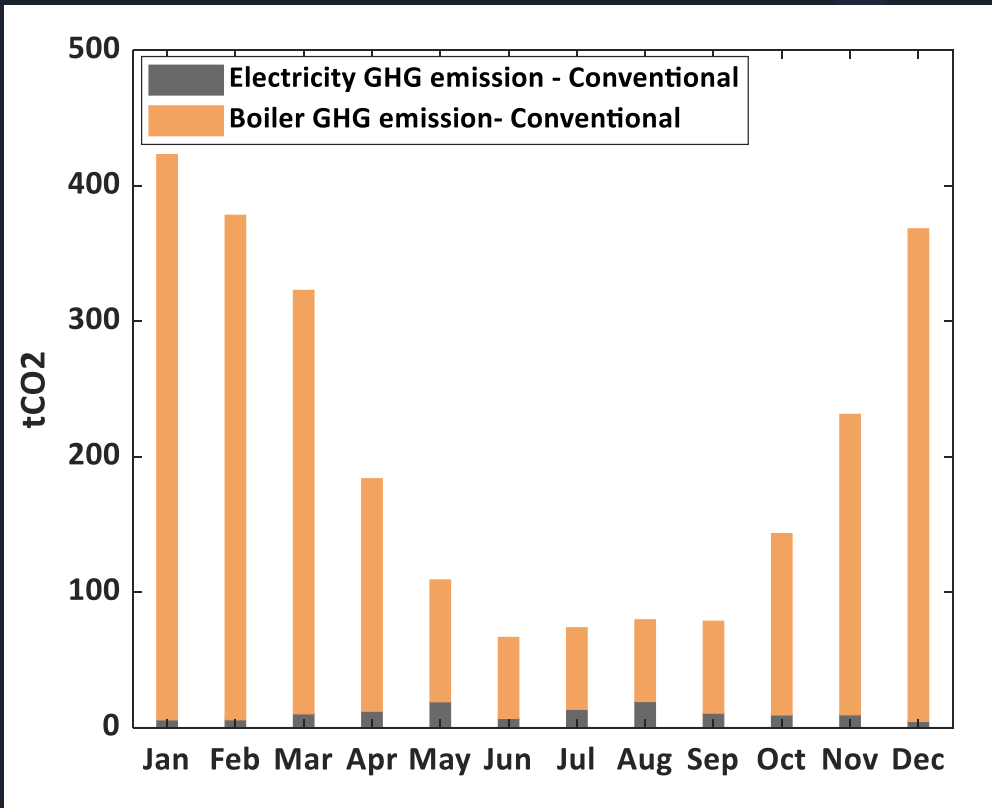


□ The ICE-Harvest system reduces residual heat from power generation by 80% and residual heat from cooling by 26%

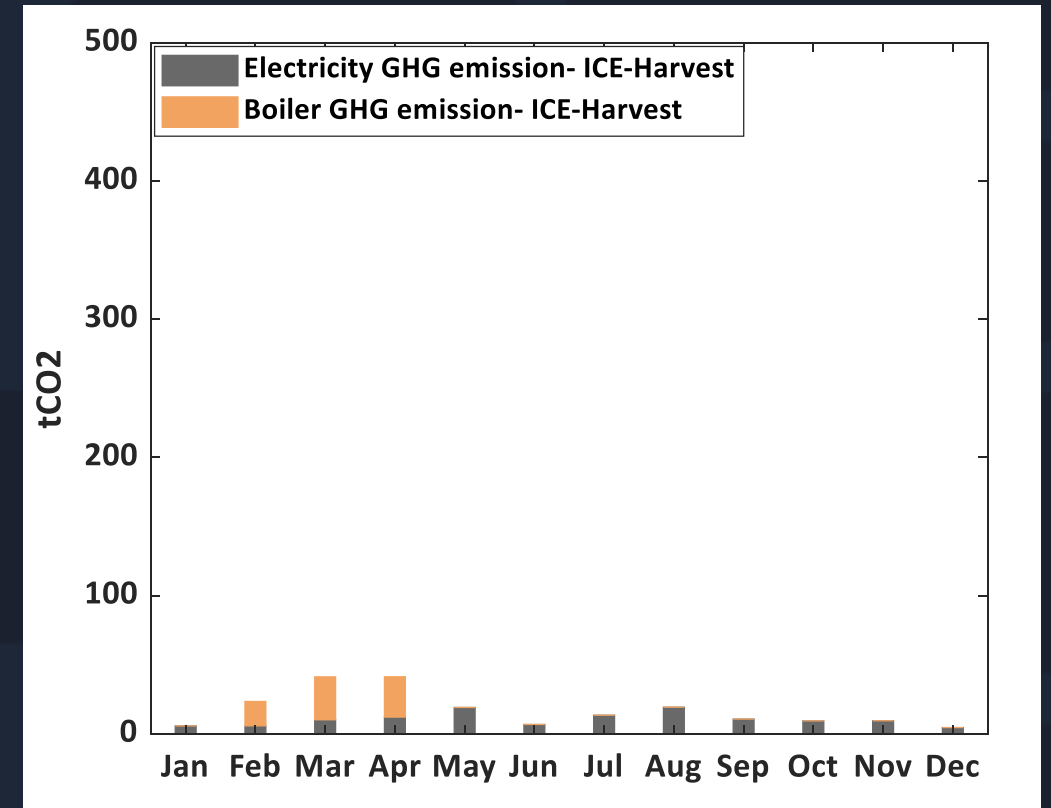


Application ICE-Harvest Methodology

Conventional Boiler



ICE-Harvest



□ The ICE-Harvest system reduces the GHG emissions of the site by 92%



Application ICE-Harvest Methodology

In Summary:

- ❑ Applying the ICE-Harvest Methodology at MIP achieves a 92% reduction in annual GHG emissions with only existing equipment
- ❑ Operating this way also reduces peak demand on the electricity grid and increases the use of renewable sources
- ❑ The ICE-Harvest system provides an easier path to Net-Zero, minimizing additional investment in carbon-free technologies



Connected Technologies For A Sustainable Future

www.hce.net

YouTube Channel – Hamilton Community Enterprises

Q&A and Discussion

- Update the group on recent **achievements**
- Relay **ongoing projects**
- Bring forward current **opportunities and challenges**





Sheridan Facility Tour



Closing Remarks



Partners in Project Green

A Program of Toronto and Region Conservation Authority



Thank You!