# Welcome to todays CHBA Net Zero Webinar!


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## The CHBA Net Zero Team

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The ultimate in comfort and efficiency

# Housekeeping

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- **You will be in "listen-only" mode** for the duration of the webinar.
- **After the presentation we will have time for questions. Please use the question section of the dashboard** throughout the webinar and your questions will be relayed to the presenter(s).
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- Building Net Zero Energy/Net Zero Energy Ready Homes
- High Performance Building Enclosure Systems

## ARCHITECT DESIGN EVENTS

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- Eliminating Thermal Bridges and Online Design Tools
- High Performance Building Envelope Solutions

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# Our Next Webinar

**October 6 from 10:30-11:30 PT / 1:30-2:30 ET**

## Turning basements into valuable, comfortable, healthy, and safe living areas

**Presented by** Salvatore D. Ciarlo, P Eng. Technical Services and Building Enclosures Director, Owens Corning Canada

With more people working from home and having kids attending remote school from home, having a home office or other livable space in the basement has become a bigger priority for many households.

Join us for this webinar to learn how you can unlock the potential of an added living space that is healthier, safe, comfortable, durable, and also minimizes radon ingress.

*Follow-up seminar **The Science of Building Better Basements** (hosted by BuildABILITY) is on November 4 from 1-5 ET. Attendance is limited to the first 30 participants.*

**Learn more and register at chba.ca/NZwebinars**

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# Today's Webinar

**September 23 from 10:30-11:30 PT / 1:30-2:30 ET**

## Affordable Energy Solutions for New Net Zero Homes

**Presented by** Jeff Salazar, Geothermal Specialist, Enbridge Gas

There are many energy options for new Net Zero Homes, which can leave a builder wondering which option is the best for their project and, more importantly, is the Net Zero option affordable? In this webinar, Jeff Salazar of Enbridge Gas will speak to how a Net Zero Home can be built cost-effectively by combining solar, hybrid heating, geothermal and natural gas solutions. In addition, Jeff will speak to how combining these energy sources provides long-term flexibility to the homeowner and how builders can easily include these options within their building permit applications - a win-win-win solution.

Join us on September 23rd to learn more about the innovative energy solution combinations for your new Net Zero Home projects.

**Members can access the recording & slide deck at chba.ca/NZwebinars**

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# Building heat
## Affordable low carbon energy options

Jeff Salazar, Geothermal Specialist, Enbridge Gas Distribution

# Agenda

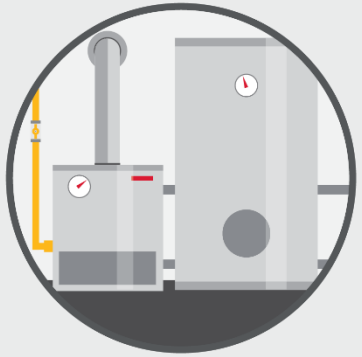
- Introduction to Enbridge offerings
- Net Zero Carbon solutions in the pipeline – RNG, H2, Carbon Capture
- Net Zero – What it means and how Enbridge can help
- Geothermal Heat pump technology
- Hybrid Heating
- Solar PV systems
- Question & answer session

# Enbridge and low-carbon energy transition in Ontario

- Enbridge exists to meet the energy needs of our customers, safely, reliably and affordably
- 75% of Ontario households depend on natural gas as an affordable energy choice, and many more rural and remote communities are looking to obtain gas service.
- At the same time municipalities, businesses and families are increasingly focused on lowering GHG emissions and energy demand.
- Enbridge has the scale and experience to help society transition to a lower-emissions, lower energy future.
- Across our business, we've committed to achieving net-zero GHG emissions in our own operations.

# Enbridge Gas – Part of a lower carbon future

## Using less gas



- Energy conservation programs
- Hybrid heating – dual fuel space heating
- Natural gas heat pumps
- District energy systems

## Non-gas solutions

- Geothermal heat pumps for heating and cooling
- MicroGeneration: Low grade heat waste recovery
- Battery storage
- Integrated resource planning (IRP)

## Carbon-neutral gas

- Hydrogen: Power to Gas
- Renewable Natural Gas (RNG)
- Carbon capture utilization and storage (CCUS)

## Fuel switching

- Replacing oil, propane and wood for home and water heating
- Compressed natural gas (CNG) vehicles

# Net Zero homes

**Challenges**

- Reduced H/C loads are difficult to manage with conventional equipment
- Solar capacity is limited to roof space and may not generate = 100% load
- Low gas volumes becoming an issue with utility feasibility requirements
- Upfront cost of heat pump equipment and systems remains at a premium to gas options

**Opportunities**

- Community based thermal energy systems managing consolidated loads
- Mix of technologies to balance upfront/end use costs and resilience
- New business models which provide value and benefits to stakeholders at all levels

# Geothermal heating and cooling systems

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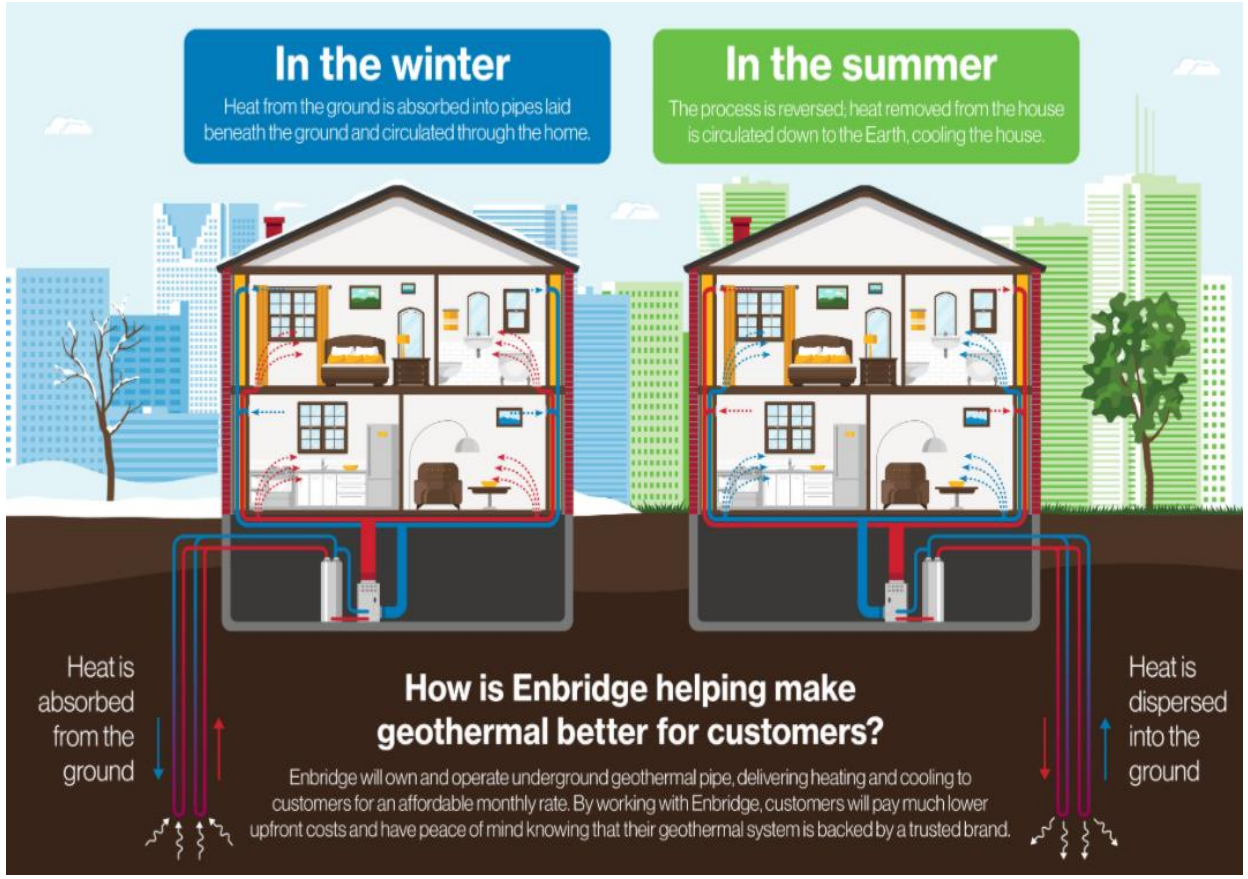
# Geothermal - what is it and how does it work?

**What?**

- Clean, renewable energy technology for heating a cooling of buildings and DHW
- Efficiencies of 300-500%
- Zero onsite carbon emissions
- In use for over 30 yrs. in Canada

**How?**

- Uses heat pump technology to harness thermal energy and move it to and from the earth
- The earth acts as a thermal battery storing and releasing energy as required
- Network of below ground piping known as a ground loop or heat exchanger
- Suitable for various applications from single-family homes to commercial high-rise buildings and entire communities

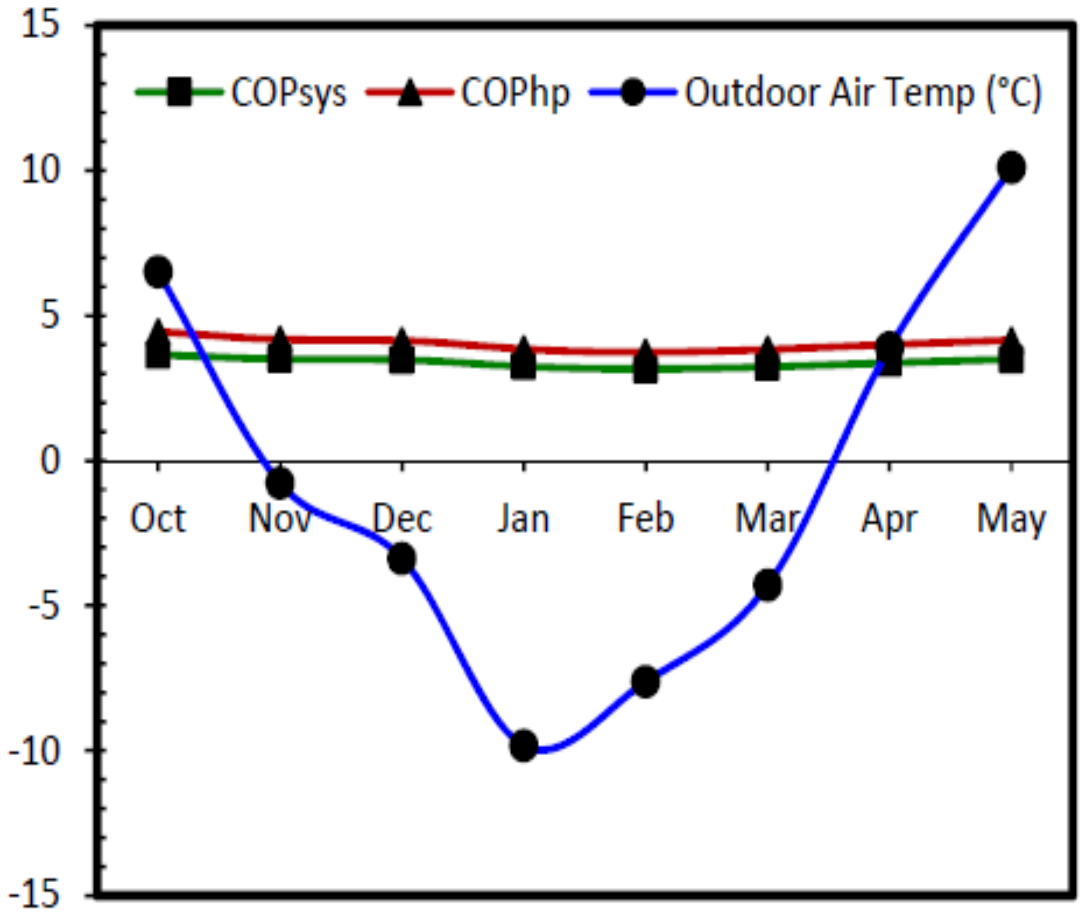


# Geothermal heat pumps – Smarter from the ground up

- Deep earth temperatures in Ontario hover around 10C year round
- Above ground temperatures can range from -30C to +40C
- Air source heat pump performance and capacity declines as the outside temperature drops
- Geothermal performance remains steady due year-round

Geothermal COP = 3 - 5  (300-500%efficiency)

ASHP COP = 1 - 3.5



A successful pilot project incorporating 4 New Construction Homes in Innisfil.

- Systems were installed in  Sept. – Nov. 2017  and operated/monitored for 3 years
- Vertical loopfields installed in the rear yard of each home
- 2 stage and variable speed ground source heat pumps were selected for the homes with rated heat pump efficiencies of 3 to 5 COP
- Systems were sized to meet 80% of peak heating load (Coldest day of the year)
- Seasonal heating loads ranged from 14,392 – 19,868 kWh
- Small electric resistance heater installed for emergency and back-up heating
- Like model “Base” home with conventional Natural gas HVAC equipment for comparison

# Monitoring and Verification

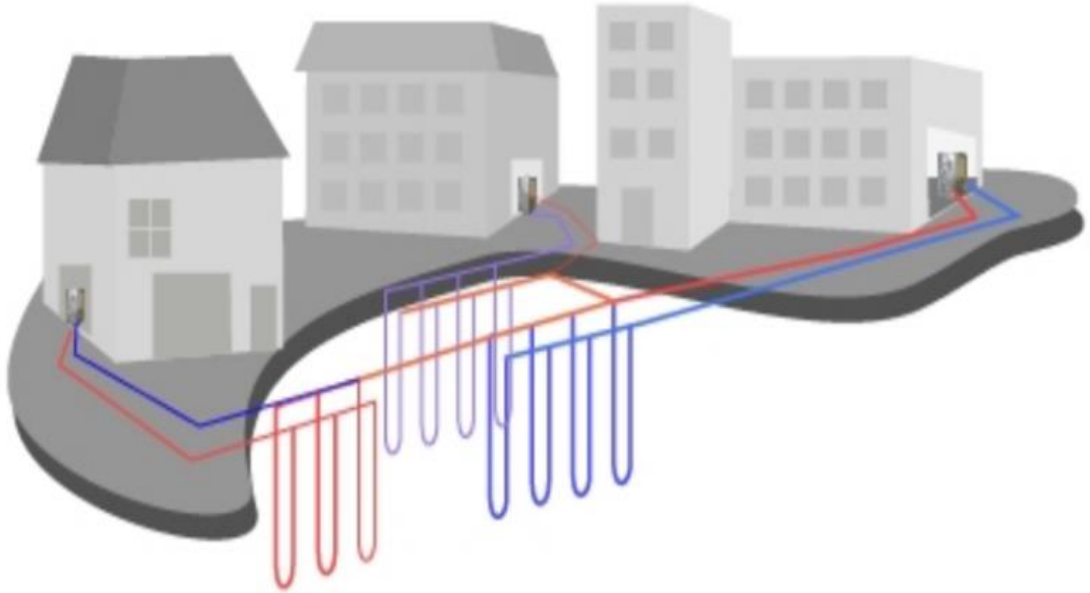
*Heat pump performance:*

- Seasonal heating COP's up to 4.2
- Seasonal Cooling COP's up to 12.9
- Heat pump system provided ~ 40% of the domestic hot water load through the desuperheater function.
- Indoor comfort and air flow surpassed homeowner expectations when compared to conventional systems in previous homes.

*Energy Consumption*

- *25% reduction in energy costs compared to natural gas base home*
- *Up to 46% reduction compared to ASHP technology*
- *Average yearly consumption between 4000-5000 kWh for all heating and cooling requirements (Heating + cooling load 16,207)*

# Networked Geothermal Systems (Ambient loop)



- Individual heat pump in each building provides flexible options and control
- Each building connected to community heat exchanger(s)
- Multiple heat exchanger options including vertical bores, horizontal loops and open loop(water source)
- Below ground pumping vaults required in larger systems to manage energy transfer and distribution
- Micro District option provides simplified piping/pumping requirements
- Best suited for med/high-density communities with mixed use buildings

Image courtesy of https://www.aceee.org/files/proceedings/2012/data/papers/0193-000349.pdf

# Central Plant Geothermal District systems

- Central plant housing multiple large capacity heat pumps
- Connected to single large borefield (typically vertical)
- Flexible with potential to incorporate multiple energy sources/technologies
- 4 pipe energy distribution provides heating and cooling year round
- Simplified mechanicals at building level with heat exchangers

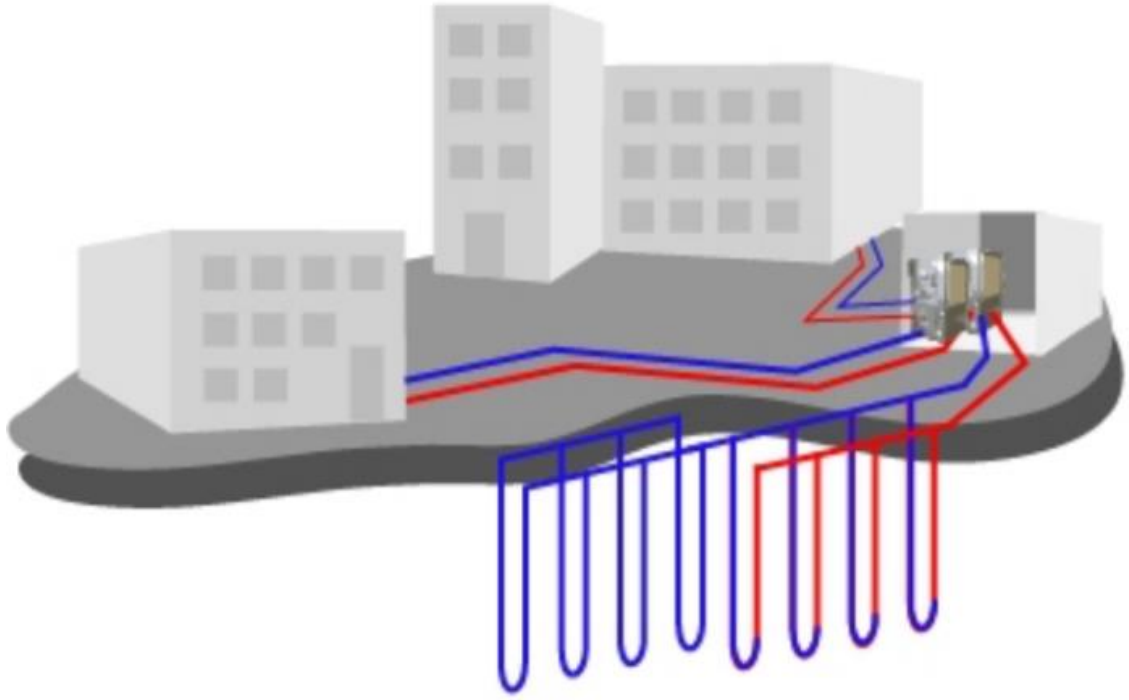


Image courtesy of https://www.aceee.org/files/proceedings/2012/data/papers/0193-000349.pdf

# Enbridge Geothermal Program

## Overview:

- Turnkey geothermal infrastructure for each home/building in the community
- No upfront cost to developer, builder or building owners
- Ongoing operation and maintenance including performance monitoring
- Design, Construction and Sales support on the Geothermal aspects of the development

## Loop options:

- Single loop per building (Cost effective and simplified design)
- Micro District applications servicing multiple buildings (Block towns, MURB, etc.)
- Full community systems (Ambient Loop or Central Plant District)

## Heat Pumps and interior HVAC:

- Must be installed by certified/trained geo contractors with commissioning oversight by Enbridge
- Ductwork, electrical and other HVAC related work can be completed by builder trades as per business as usual

# Geothermal Energy Service

Flexible terms and options include:

- Lease agreement for single family/single loop applications
  - Agreement is signed by the homeowner with builder's Agreement of Purchase & Sale (similar process to rental water heater)
  - A monthly "Geothermal" fee based on system capacity is charged to the homeowner.
  - Fixed term contract with buyout option from year 1 to end of term
- Energy as a service model
  - Flat fee or metered energy charge based on system size, building type
  - Flexible terms
  - Performance guarantee on energy costs and efficiency of system

All contracts include installation, commissioning, maintenance, repairs and replacement of the loop asset if required.

# Why Hybrid Heating?

## Saving energy is just one of the benefits

1) **Effortless and convenient**
   Smart controls automatically switch between natural gas and electric heat, based on which source is most efficient at a given time.

2) **Heat your home more efficiently**
   By optimizing your energy mix based on the source that's the most cost effective, you'll reduce energy costs over the long term.

3) **Gain more resilience**
   With two heating systems, you always have energy-cost resiliency and the option to heat with natural gas or electric.

4) **Lower your carbon footprint**
   Hybrid systems reduce GHG emissions by as much as 30%.

Help fight climate change and reduce long-term costs with a

Hybrid System

Heat your home more efficiently with Hybrid Heating

# Solar PV: Rental Model

- Enbridge's unregulated program focuses on partnering with homebuilders to install solar PV systems in new homes
- Enbridge may also offer interested home buyers additional innovative premium options such as full net-zero solar systems or partial load
- Enbridge will work with a third-party solar PV contractor to complete the design and installation, offering homebuyers a turnkey solution
- Solar systems will take advantage of the net-metering programs, where applicable
- Enbridge will lease the solar system to homebuyers for a monthly charge, which will include any required maintenance

# Q&A

For all inquiries, please contact Jeff Salazar

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