

Demonstration Project: Gas Absorption Heat Pumps for domestic hot water

Presented at the 2019 Hot Water Forum
March 12, 2019

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Gas Absorption Heat Pumps

Commercial DHW demonstration

Agenda:

- Why Enbridge is interested in Gas Heat Pumps/Objective of Demonstration
- Demonstration details – Pre & Post
- Results & Business Case (Energy & Environmental)
- Learnings from demonstration
- Future sites

Gas Absorption Heat Pump

Objective of GAHP DHW Demonstration



GAHP Commercial DHW Heating Demonstration to:

- Measure Performance and Operating Characteristics
- Reliability in Cold Climate
- Examine Gas Heat Pump Retrofit Process

GAS ABSORPTION HEAT PUMP

Demonstration details

Toronto Community Housing

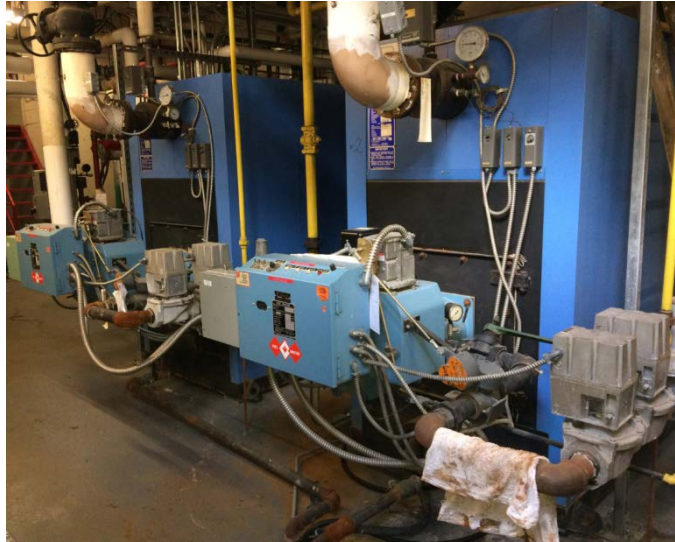


Pilot Site:

- Senior Social Housing Complex
Toronto, Ontario (TCH)
- 372 Total Units (over two bldg.)
- Hydronic Space Heating during
Winter and DHW year-round

GAS ABSORPTION HEAT PUMP

Demonstration details



Pre-Retrofit Boiler Plant:

- Combined Space Heating and DHW system
- Two 4300MBH Watertube Boilers (54% avg. measured Efficiency)
- 3200 gal. Storage Tank (130°F)

GAS ABSORPTION HEAT PUMP

Demonstration details



Post-Retrofit Boiler Plant:

- Two 123MBH GAHP's (partial DHW)
- Two 878MBH Condensing Boilers (peak DHW & Space Htg.)
- Old Watertube Boiler as Peaker

GAS ABSORPTION HEAT PUMP

Performance and operation

CityNews LOCAL WATCH LIVE CONTACT US Q

Freezing Toronto temps break 57-year record

BY NEWS STAFF
POSTED DEC 28, 2017 6:17 AM EDT LAST UPDATED DEC 28, 2017 AT 4:18 PM EDT

Global NEWS Toronto Change Location News & Radio Programs Newscasts, Radio, and Videos

World Canada Local Politics Smart Living Money Entertainment Health Commentary Trending

WEATHER January 5, 2018 10:52 am Updated: January 5, 2018 1:33 pm

Toronto's low temperatures break records as deep freeze continues

By Jessica Patton
Web Coordinator Global News

THE STAR

It's official . . . Toronto breaks record for cold weather for Jan. 5

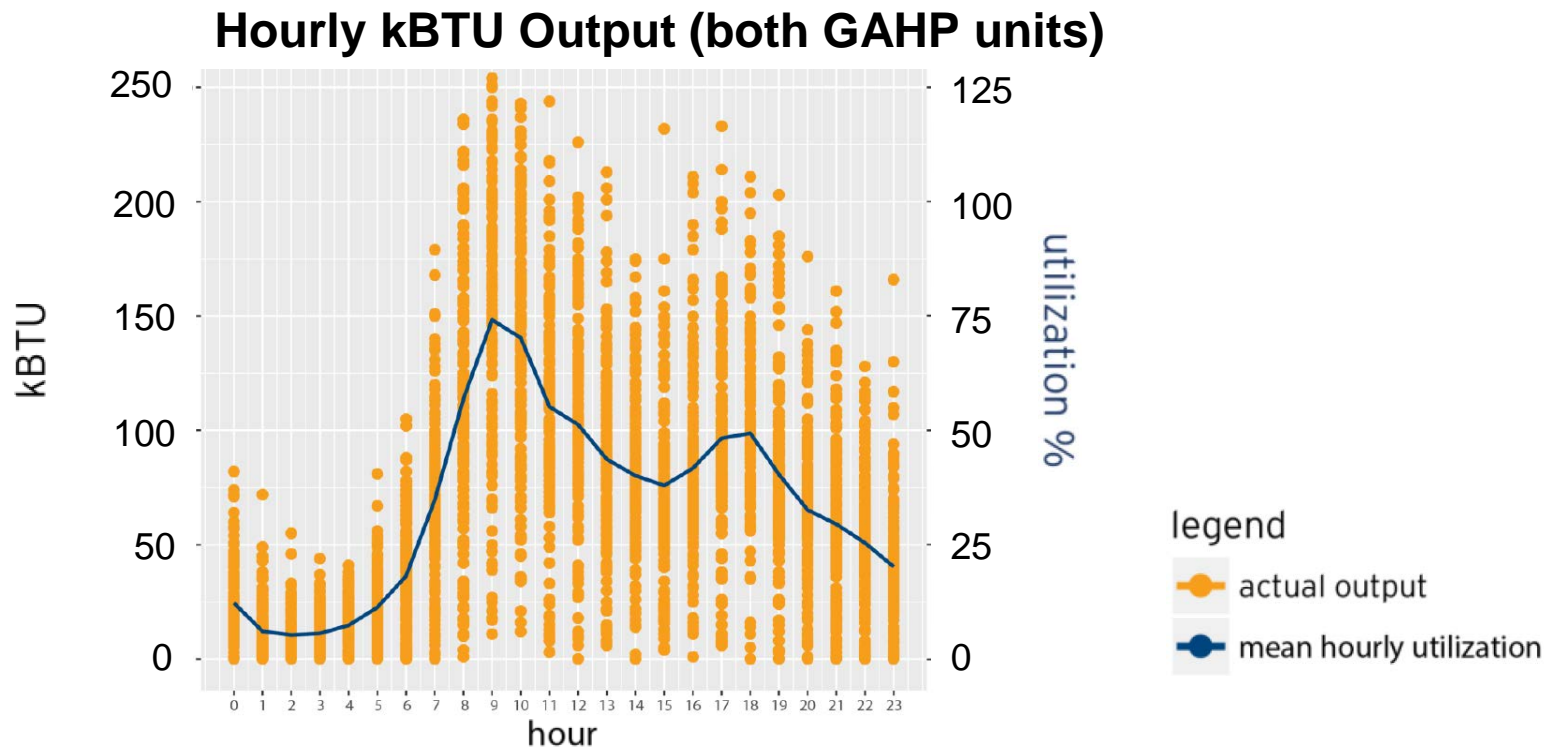
By BRYANN AGUILAR Staff Reporter
Fri., Jan. 5, 2018



It's no bomb cyclone, but it's still record-breaking cold in Toronto on Friday. (ANDREW FRANCIS WALLACE / TORONTO STAR)

GAS ABSORPTION HEAT PUMP

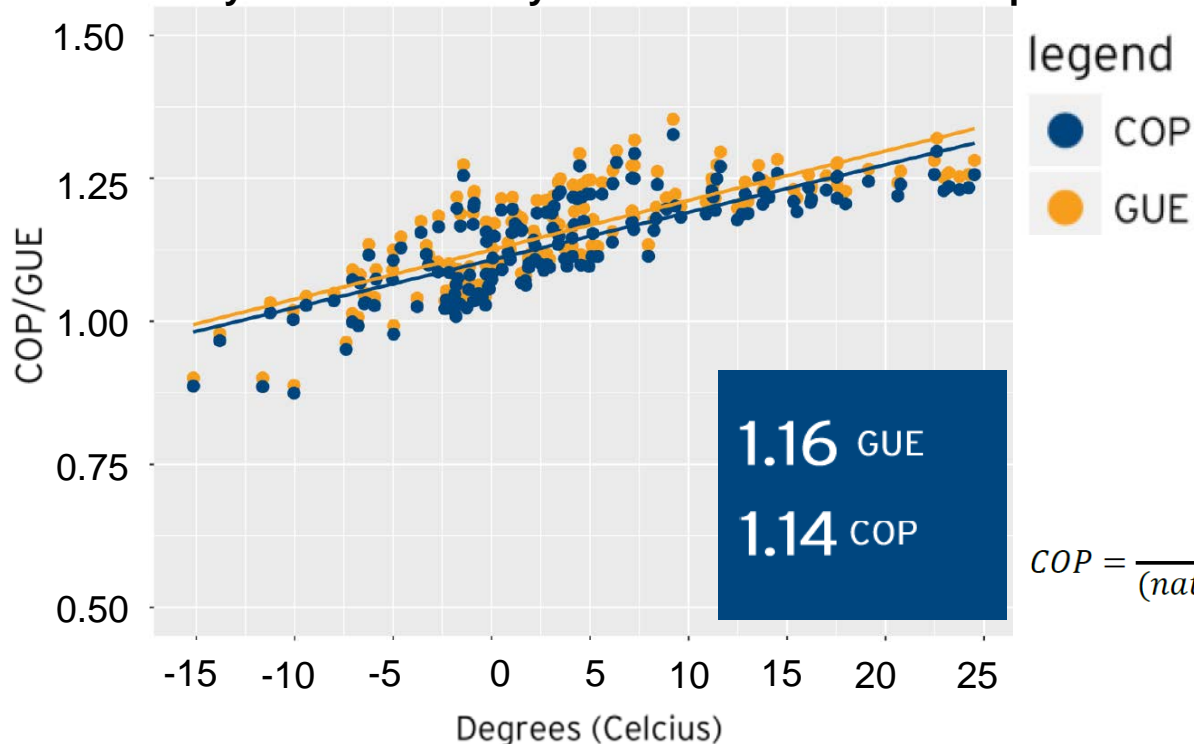
Performance and operation



GAS ABSORPTION HEAT PUMP

Performance and Operation

Daily GAHP Efficiency vs. Ambient Outdoor Temperature



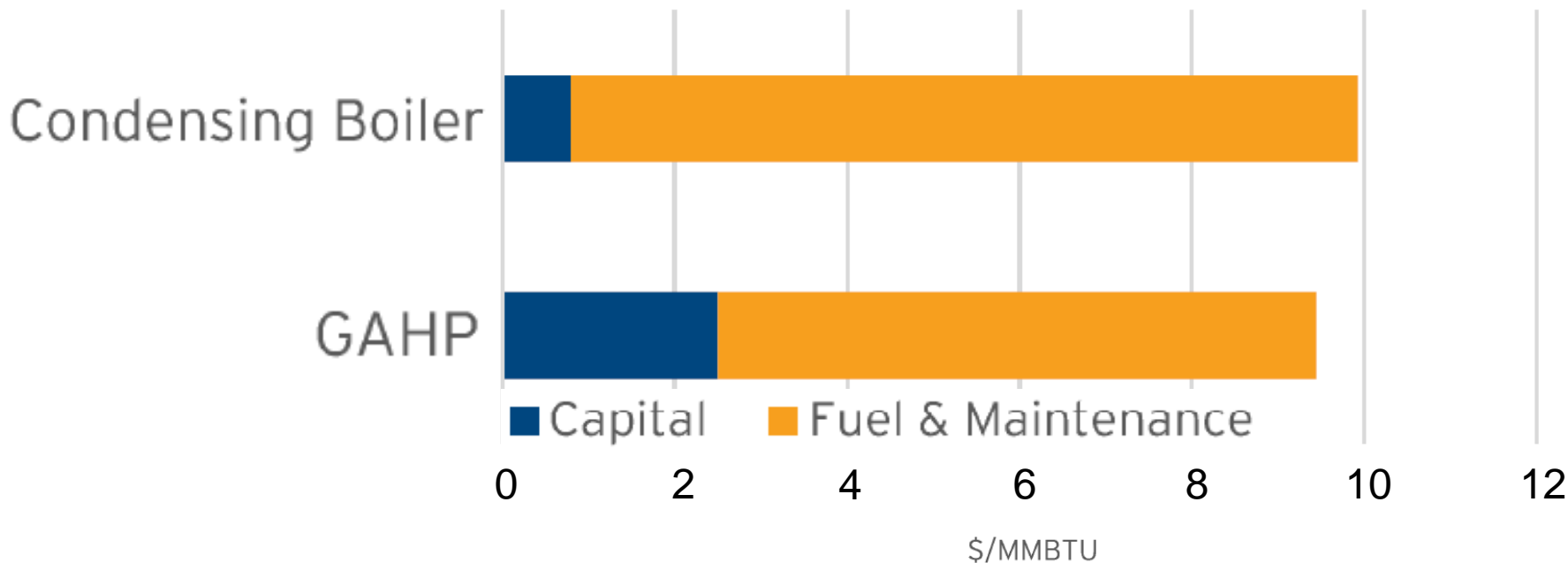
$$GUE = \frac{\text{usable heat supplied}}{\text{natural gas consumed}}$$

$$COP = \frac{\text{usable heat supplied}}{(\text{natural gas consumed} + \text{electricity consumed})}$$

GAS ABSORPTION HEAT PUMP

Cost consideration

Levelized Cost of Service (\$/MMBTU output)



GAS ABSORPTION HEAT PUMP

Learnings from demonstration

Successes	Barriers
<ul style="list-style-type: none">• Significant performance improvement• Reliable cold climate operation• Easy maintenance	<ul style="list-style-type: none">• High initial capital cost• Significant designing and commissioning effort• Lack of engineers and contractors with experience

GAS ABSORPTION HEAT PUMP

Learnings from demonstration



MAXIMIZE

- GAHP utilization
- tuning / optimization resources
- warm weather operation
- cycle length

MINIMIZE



- hydronic loop exposed to outdoor temperatures
- acoustic impacts on building occupants
- return temperatures
- time between cycles

Next Steps

- Establish design package and guidelines
 - Optimize Payback
 - Optimize Efficiency
 - Optimize Emissions
- Examine integration opportunities with other technologies
 - Thermal storage, CHP, Instantaneous water heater, etc.
- More demonstration sites
 - Multi-Family, Restaurants, Gyms



THANK YOU.

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Detailed project report is available on TAF's website.

taf.ca

Gas Absorption Heat Pumps

APPENDIX: SCHEMATIC DIAGRAM

