ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 1

Question(s):

Enbridge Gas has proposed a mix of programs that allow opportunities for customers of all sizes to receive incentive and/or education on natural gas efficiency. Within each of the larger programs are specific efficiency offerings that provide various incentives, education and outreach to customers.

a) For each offering within each program category, please provide the following:
   i. The need for each offering, including any market analysis conducted to identify gaps in product availability, pricing barriers, low adoption rates or lack of familiarity/understanding
   ii. A list of the measures included and the customer incentives offered for each
   iii. A discussion on how Enbridge Gas's proposal maximizes opportunities for natural gas savings

Response

a) i) A variety of factors were taken into consideration in the development of programs and offerings to support each market sector. They were as follows:

- The objectives outlined in the OEB's December 1, 2020 letter (EB-2019-0003);
- The guiding principles outlined in the proposed Framework – Exhibit C, Tab 1, Schedule 1, Page 6-8
- Lessons learned by Enbridge Gas through delivering programming over the past 25 years
- Learning from evaluation studies conducted throughout the 2015-2020 Multi-Year DSM Plan

- Analysis of customer data, including historical participation rates, consumption profiles, building stock and most commonly implemented measures, as outlined in Exhibit I.9.EGI.STAFF.22a.
- Feedback from stakeholders and customers received through the course of the 2015-2020 Multi-Year DSM Plan, 2021 DSM Plan rollover, and in support of the development of this application. See response to Exhibit I.17.EGI.PP.48 for additional information.
- Forecasted changes to codes and standards
- Jurisdictional scans associated with various offerings and measures. See Exhibit I.3.EGI.STAFF.1 for examples of how jurisdictional scans were leveraged
- Complementary efficiency programs available to customers such as the Canada Greener Homes Grant program and those available through the IESO.

Please refer to the following filed in evidence for program and offering specific information:

- Residential Program, Exhibit E, Tab 1, Schedule 2, Page 1-7
- Low Income Program, Exhibit E, Tab 1, Schedule 3, Page 1-3
- Commercial Program, Exhibit E, Tab 1, Schedule 4, Page 1-10
- Industrial Program, Exhibit E, Tab 1, Schedule 5, Page 1-6
- Large Volume Program, Exhibit E, Tab 1, Schedule 6, Page 1-4
- Energy Performance Program, Exhibit E, Tab 2, Schedule 1, Page 1-6
- Building Beyond Code Program Exhibit E, Tab 2, Schedule 2, Page 1-4
- Low Carbon Transition Program, Exhibit E, Tab 3, Schedule 1, Page 1-2

ii) Please see the following filed in evidence:

- Residential Program Offerings:
  - Whole Home, Exhibit E, Tab 1, Schedule 2, Table 1, Page 12-13
  - Single Measure, Exhibit E, Tab 1, Schedule 2, Page 17, Paragraph 50
  - Smart Home, Exhibit E, Tab 1, Schedule 2, Page 22, Paragraph 69

- Low Income Program:
  - Home Winterproofing, Exhibit E, Tab 1, Schedule 3, Page 11-12, Paragraph 25
  - Affordable Housing Multi-Residential, Exhibit E, Tab 1, Schedule 3, Page 16-18

- Commercial Program:
  - Commercial Custom[1], Exhibit E, Tab 1, Schedule 4, Page 19, Paragraph 52-53
  - Direct Install, Exhibit E, Tab 1, Schedule, 4, Page 24-25, Paragraph 72-73, 76-77
  - Prescriptive Downstream, Exhibit E, Tab 1, Schedule, 4, Page 29, Table 2
  - Prescriptive Midstream, Exhibit E, Tab 1, Schedule, 4, Page 35, Table 3

- Industrial Program:
  - Industrial Custom[2], Exhibit E, Tab 1, Schedule 5, Page 13, Paragraph 37-40

- Large Volume Program:
  - Direct Access, Exhibit E, Tab 1, Schedule 6, Page 7-8, Paragraph 21-23

- Energy Performance Program:
  - Whole Building Pay for Performance, Exhibit E, Tab 2, Schedule 1, Page 7-8, Paragraph 16-19

- Building Beyond Code:
  - Residential Savings by Design, Exhibit E, Tab 2, Schedule 2, Page 12-13, Paragraph 29-33
  - Affordable Housing Savings by Design, Exhibit E, Tab 2, Schedule 2, Page 23-24, Paragraph 76-77
  - Commercial Savings by Design, Exhibit E, Tab 2, Schedule 2, Page 18 of 33, Paragraph 58
  - Commercial Air Tightness Testing, Exhibit E, Tab 2, Schedule 2, Page 31-32, Paragraph 96

- Low Carbon Transition Program
  - See Exhibit I.10h.EGI.Staff.77f.

[1] Commercial Custom eligible projects are those that meet offering eligibility requirements and contribute to natural gas savings. Examples of common measures include but are not limited to boiler upgrades and controls, Building Automation Systems (BAS), heat reflector panels, ventilation controls and envelope improvements such as wall and roof insulation.

[2] Industrial Custom eligible projects are those that meet offering eligibility requirements and contribute to natural gas savings. Examples of common types of improvements include but are not limited to process improvements, heat recovery, pipe/tank insulation and ventilation controls.

iii) As outlined in Exhibit D, Tab 1, Schedule 1, Page 1 of 26, Enbridge Gas's proposal was developed based on optimizing program performance while being responsive to guiding principles, including:

- Delivery of programming to all customer groups appropriately tailored to encourage DSM participation over time to all segments of the market;
- Targeting key segments of the market, including small volume, low income and harder-to-reach market segments;
- Improved identification of customers with significant efficiency improvement opportunity;
- Minimization of lost opportunities and quest for long term energy savings;
- Consideration of opportunities to coordinate delivery of DSM programs with electricity CDM programs or other external complementary activities; and,
- Support for technology development and market adoption of new and lower-carbon alternatives to enable longer term energy efficiency and carbon reduction.

The proposal developed by Enbridge Gas in this DSM Plan incorporates new activities, offerings and technologies aimed at addressing the full range of DSM customers in an effort to optimize overall program results and make good use of ratepayer funding.

Specific examples of how each program and offering with natural gas savings targets were optimized to balance guiding principles with maximizing savings potential are outlined below.

Residential Program

Enbridge Gas is introducing an expanded Residential program, which will include three offerings representing a varying degree of investment in both cost and time. Specifically, the customer will be provided with more options to participate in DSM programming beyond the whole home approach which was the predominant offering for participation over the last two DSM plans. Depending on their particular situation and needs, a customer can now choose to pursue a whole home approach to undertake energy efficiency improvements or implement single measure upgrades in the home such as professional air sealing, attic, wall or basement insulation improvement projects, thereby expanding choices for consumers to manage their energy consumption and bills. Further, the Smart Home offering will now incorporate an increased incentive for moderate income households in coordination with the IESO CDM programing to overcome a potential participation cost barrier associated with this segment of the market.

The new Residential Program and the flexible design with multiple points of entry should allow for more widespread opportunity for customer participation based on their individual needs and situation.

Low Income Program

A variety of approaches are used to maximize opportunities for natural gas savings in the low-income market which is a specific guiding principle that Enbridge Gas supports through its Home Winterproofing offering for single-family homes, and its Affordable Multi-Residential offerings.

For Home Winterproofing, some of the approaches are:

- Extending the reach through collaboration such as the IESO
- Focusing on reaching specific sub segments of the market such as off-reserve and faith-based outreach strategies
- Partnerships with various associations such as social agencies
- Address certain Health and Safety issues in homes to resolve barrier to access program

For Affordable Housing Multi-Residential please refer to Exhibit I.10b.EGI.STAFF.42a.

Commercial Program

Enbridge Gas's proposed Commercial program is designed to support customers across all commercial market segments overcome key barriers to participation to increase overall natural gas savings.

The majority of savings results associated with the Commercial Program are attributable to the Commercial Custom offering. The Commercial Custom offering is delivered by Enbridge Energy Solutions Advisors who work directly with large commercial customers to help them identify, quantify, and prioritize efficiency opportunities. Growth in results associated with this offering will be based on efforts to reduce free-ridership rates (see Exhibit E, Tab 1, Schedule 4, Pages 11-12, Paragraph 39), and broadening customer reach through increased engagement with service providers, as outlined in Exhibit E, Tab 2, Schedule 4, Page 19, Paragraph 54-55.

Consistent with guiding principles, significant effort has also been placed on growing participation among the traditionally harder to reach small commercial customer base. Offerings catering to this underserved group of customers are typically less cost effective, as they require higher levels of engagement relative to project size. Growth will be driven by expanding the Direct Install offering to include more measures, allowing more access to turnkey solutions for small customers who otherwise would not have the means to engage in energy efficiency opportunities. A new Midstream offering

will also be introduced to drive influence and adoption of high efficiency measures at a distributor and contractor level, minimizing the effort required by customers to benefit from participating in DSM. Enbridge Gas will also seek opportunities to collaborate with the IESO on measures that support both electric and gas savings in an effort to share program costs.

Industrial Program

Enbridge Gas's Industrial Program consists of the Industrial Custom offering to allow flexibility to address the unique process, equipment and customer specific characteristics that vary between industrial facilities. The offering provides participants with technical support delivered by a dedicated Enbridge Gas Energy Solutions Advisor (ESA) as well as financial incentives to overcome key barriers associated with the identification, quantification, justification, and implementation of energy efficiency measures. Growth in natural gas savings results associated with the Industrial Program will be driven by implementing measures to reduce free ridership, as outlined in Exhibit E, Tab 1, Schedule 5, page 14, paragraphs 41 to 45, and engaging a broader group of customers in participating in the offering.

Several measures have been proposed to increase participation in the Industrial custom offering, which include: adding additional ESAs so that a broader group of customers can be reached and supported in a given year, stepping up incentives available for audits, studies and limited time offers to stimulate investigation and application of different types of efficiency improvement opportunities, and the introduction of a new tiered incentive structure that is believed to better accommodate financial barriers associated with implementing smaller projects, as outlined in Exhibit E, Tab 1, Schedule 5, page 13, paragraph 39 to 40.

Industrial customers will also be eligible to participate in the commercial Direct Install, Prescriptive Downstream and Prescriptive Midstream offerings. This will be especially beneficial in broadening reach among small industrial customers with predominant space heating loads that are more akin to a commercial warehouse facility than a large industrial plant.

Large Volume Program

Enbridge Gas has been delivering the Direct Access offering to Large Volume customers since 2013. Although the self-direct model has been well received by some participants, adjustments to the offering were proposed to reduce barriers to participation by removing limitations on eligible measures as outlined in Exhibit E, Tab 1, Schedule 6, page 8, paragraph 26.

Performance Based Program

In exploring alternative ways for commercial customers to participate in DSM offerings, the decision was made to introduce a Whole Building P4P offering. The offering is designed to support customers interested in committing to drive deeper savings year-over-year. Unique to this offering is that it leverages metered data to establish baselines, set performance targets and assess and incent all capital, operational and/or behavioural improvements made over a defined period of time. A soft launch was proposed to introduce this offering to the market, with the opportunity of expansion at the Mid-Term pending its success in engaging interested participants.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10

Reference:

Exhibit D, Tab 1, Schedule 4, p.2, Table 1

Question(s):

Enbridge Gas provides its forecast 2023 TRC-Plus and Net Benefits from its proposed suite of programs and offerings.

a) Enbridge Gas has proposed that TRC-plus testing should be performed at the program and portfolio level (Framework, 10.3), however has provided TRC-plus results at the offering level in this table. At what level does Enbridge Gas believe TRC-plus testing should occur and why?

b) Please discuss the drivers causing the Residential Single Measure offering to result in a TRC-Plus ratio of 1.19. In your response, please provide measure-level information, including incremental costs and estimated natural gas savings.

c) Please discuss the impacts to cost effectiveness and net benefits, if any, of additional smart technologies being included in the Residential Smart Home offering as opposed to the offering simply incentivizing smart thermostats.

d) Please discuss and show the cost-effectiveness inputs and calculations for the Low-Income Home Winterproofing offering. In your response, please discuss how this offering and the Residential Whole Home offering have the same TRC-Plus ratio.

Response

a) Enbridge Gas believes the TRC-Plus test should be assessed at the program and portfolio level for screening purposes. As outlined in the OEB's December 1, 2020

DSM Letter, "the OEB expects that all programs continue to be cost-effective as defined in the Mid-Term Review Report."[1]

To assist the OEB and interested parties, and provide additional information and transparency, Enbridge Gas has provided a table[2] in the Application that outlines the forecasted TRC-Plus ratios at each of the portfolio, program, and offering levels.

While Enbridge Gas strives for all proposed program offerings to be cost-effective based on a TRC-Plus screening, the Company believes it is appropriate to manage DSM opportunities at a program level. This will allow for the inclusion of beneficial offerings/measures, for example expensive long life weatherization/envelope upgrades, that may be less cost-effective on a stand-alone basis but are important energy efficiency drivers in the residential sector and based on their merits should be part of the Residential program. Enbridge Gas believes any such opportunities should be proposed and continued as appropriate based on their specific merits.

It should be noted that the hybrid shareholder incentive proposal, which includes a shared savings mechanism based on net benefits, clearly illustrates an incentive for the Company to pursue and optimize cost-effective efforts while maintaining a focused effort on each program/scorecard.

b) Please see response to Exhibit I.5.EGI.GEC.7 for TRC-Plus inputs for the Single Measure offering.

Please see response to Exhibit I.10a.EGI.Staff.36c which provides background on how the insulation assumptions were developed. The Professional Air Sealing assumptions are conservative estimates based on early participant data from the Professional Air Sealing Pilot. The values are being used as a placeholder as the Air Sealing Pilot is ongoing. These values will be updated based on the pilot outcomes.

c) Currently, the only measure included in the Smart Home offering are Smart Thermostats. The impact of other measures on cost effectiveness and net benefits will be assessed when/if other measures are added to the offering.

d) Please see response to Exhibit I.5.EGI.GEC.7 for TRC-Plus inputs for the Home Winterproofing (HWP) offering. The cost-effectiveness calculation for the WHP offering is as follows:

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.
[2] EB-2021-0002, DSM Multi-year Plan and Framework Application (Updated September 29, 2021), Exhibit D, Tab 1, Schedule 4, p. 2.

Offering	TRC+ Benefit A	TRC Costs B	Net Benefits A-B	TRC-Plus Ratio A/B
Low Income Home Winterproofing	**$22,736,285**	**$14,088,455**	**8,647,829**	**1.61**

It is a coincidence that the TRC-Plus Ratios for the HWP and Whole Home (WH) offerings are the same, as there are significant differences in offer design. The TRC-Plus ratio (Exhibit D, Tab 1, Schedule 4, page 2, Table 1) is impacted by various factors.

The HWP offer provides participants with a blend of measures including insulation, adaptive thermostats and basic measures (i.e. showerheads, aerators and pipe wrap). Measure savings are based on a combination of custom and prescriptive assumptions. Measure installs are based on the requirements of the home, however, during the audit, delivery agents consider cost effectiveness when determining the measures installed within the participants home.

The WH offering takes a holistic Whole Home approach to upgrades (modeling savings in NRCan HOT2000 software) by offering participants a more varied measure mix which includes insulation, mechanicals, and windows/doors. This variation in measure mix is an important component of attracting Whole Home participants to the offering and encouraging them to undertake measures over and above what they would have done in absence of the offer.

Another factor is related to the type of homes participating in these two offers. The WH offering is open to all residential customers, regardless of age and size of home, whereas HWP is offered on a more targeted basis, and includes income screening. Homes within the HWP program are typically older vintage, and in a condition that requires more improvement, as occupants have less disposable income to put towards home improvements.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2

Question(s):

Enbridge Gas has proposed a Residential Program with three offerings: the Whole Home, Single Measure and Smart Home offerings.

a) Please provide net and gross savings estimates at the offering level.

b) Please provide all workpapers and analysis showing all the measure level assumptions used to derive the proposed costs and savings in their native format with formulas intact.

Response

a) Please see the following table.

	Gross Savings Estimate (2023)	Net Savings Estimate (2023)
Whole Home	8,167,500	7,759,125
Single Measure	1,148,222	826,549
Smart Home	6,428,750	6,171,600

b) Enbridge Gas has provided Program Offering assumptions in the response to Exhibit I.5.EGI.GEC.7. Please see the response to Exhibit I.6.EGI.CCC.10a for an overview of the factors Enbridge Gas considered in the development of costs and savings.

The **Whole Home** savings assumptions were derived through examination of historical participant savings outcomes.

Smart Thermostat values are based on those found in the current Technical Resource Manual.

For **Air Sealing** measure level savings assumptions, please refer to the response at Exhibit I.10.EGI.STAFF.28 b). Supplemental to that explanation, Enbridge Gas applied savings observed from Pilot participants that did not have an HRV/ERV, 196 m3, to reflect homes most likely to participate.

For the **Insulation Measures** (attic, basement, and wall) in the Single Measure offering, savings assumptions derived to inform the APS mirror model were reduced by a further 40% to be conservative. These values will remain as placeholders until the TRM research underway is concluded.

An example of the steps taken to establish APS values is detailed below using Attic Insulation.

Attic Insulation

The following procedure was followed to estimate Attic Insulation savings input assumption for the APS.

1. Filter historical program data (2018 & 2019 program year) as explained above. The table below present a summary of this step.

Attic Insulation data summary (filter applied 2 measures Attic Insulation + Furnace/Boiler)

PROGRAM YEAR	# PARTICIPANTS	SUM. OF GROSS NATRUAL GAS SAVINGS (M3/YR)	SUM. OF GROSS ELETRICITY SAVINGS (KWH/YR)
2018	341	138,957	121,263
2019	310	110,791	121,346

2. Determine Average Natural Gas and Electricity savings from step 1. The table below presents a summary of this step.

Attic Insulation gross average savings (filter applied: 2 measures Attic Insulation + Furnace/Boiler)

MEASURE	# PARTICIPANTS	AVE. OF GROSS NATRUAL GAS SAVIGNS (M3/YR)	AVE. OF GROSS ELETRICITY SAVIGNS (KWH/YR)
Attic Insulation	651	384	373

3. Develop adjustment factors: baseline adjustment from 90% to 95% AFUE[1].
    a. Apply baseline adjustment algorithm to 2019 gross sample data for 90% and 95% AFUE furnace baseline.
    b. Find the difference
    c. Determine adjustment factor. The table below presents a summary of steps 3a. to 3c.

Attic Insultation measure adjustment factor[2]

SCENARIO	ANNUAL NATRUAL GAS SAVINGS (M3/YR) ATTIC INSULATION
2019_90% AFUE	62,190
2019_95% AFUE	47,917
Baseline adjustment factor	0.770

4. Apply factor from step 3 to adjust average savings in step 2. The tables below present a summary of this step.

Attic Insulation savings input assumption for APS

MEASURE	SINGLE MEASURE ADJUSTMENT FACTOR	ADJUSTED NATRUAL GAS SAVINGS (M3/YR PER HOME)	ADJUSTED ELETRICITY SAVINGS (KWH/YR PER HOME)
Attic Insulation	0.770	296	287

The final step to arrive at 178 m3 was a 40% reduction from the 296 m3 attic insulation value illustrated above.

[1] Including impact of baseline change as a result of Canada Increasing Minimum Efficiency Performance Standards (MEPS) for residential furnace in 2020.
[2] Estimate only, intended for use in Program potential estimate only. Not to be used for other purposes.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Building Owners and Managers Association (BOMA)

Interrogatory

Issue 10

Reference:

EB-2021-0002, Exhibit E, Tab 2, Schedule 1, Page 3, Section 8

Question(s):

Under what circumstances will this offering be expanded to other segments during the course of this framework? How would such an expansion be funded?

Response

Please see response at Exhibit I.10f.EGI.STAFF.61a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Building Owners and Managers Association (BOMA)

Interrogatory

Issue 10

Reference:

EB-2021-0002, Exhibit E, Tab 3, Schedule 1, Page 1, Section 2

"Enbridge Gas's Low Carbon Transition program is designed to support the plans of the federal government to bring these types of low carbon technologies to market. The Low Carbon Transition program specifically focuses on expanding the deployment of heat pump technologies…"

Question(s):

Has Enbridge evaluated the relative merits of other low carbon technologies including VRF, GeoExchange, exhaust air and discharge water heat recovery and electric heat pumps compared against gas-fired heat pumps in terms of potential emission reductions and cost effectiveness? If so, please provide the results of this comparative analysis.

Has Enbridge explicitly consulted with the IESO regarding a coordinated approach to helping meet national and provincial carbon reduction goals? If so, what conclusions were reached? What limitations are there on collaboration to help maximize carbon reductions?

Does Enbridge have the authority to support GeoExchange (ground source heat pump) installations?

Response

a) Through the Commercial Custom offering Enbridge Gas has supported customers who have installed other low carbon technologies such as variable refrigerant flow (VRF) and electric heat pumps which use waste heat or geothermal heat. These are customized applications of the technology that take into account specific customer circumstances and baseline conditions. These technologies also include an electricity penalty which makes them less attractive when determining Total Resource Cost.

Enbridge Gas has not performed an explicit comparative analysis of these various technologies to gas heat pumps. Enbridge Gas evaluates technologies relative to their most reasonable baselines. The most common application of many of these aforementioned technologies is different than that of gas heat pumps.

Enbridge Gas specifically pursues natural gas heat pumps in its Commercial Low Carbon offering for the following reasons:

- Natural gas heat pumps are called out as being an important contributor to achieving the federal government's aspirations goals for space heating;[1]
- Natural gas heat pumps are a more direct replacement for a gas boiler in a retrofit scenario and thus have significant market potential as a measure;
- Enbridge Gas has completed research to demonstrate the potential for cost effective applications;[2]
- Whereas Enbridge Gas sees the growing market acceptance of technologies such as electric VRF, natural gas heat pumps face greater barriers in relation to accessibility, awareness, and acceptance.

As market conditions evolve, Enbridge Gas will continue to evaluate alternative commercial low carbon technologies through its research and custom offer and consider them for future inclusion in its Commercial Low Carbon offering if appropriate and aligned with the OEB's stated DSM objectives.

b) No such consultation has occurred. Please see response to Exhibit I.10.EGI.BOMA.5 regarding IESO collaboration.

c) Enbridge Gas interprets the question to ask whether the Company could provide DSM programming/customer incentives for geothermal technologies. The Company does not believe there are any restrictions based solely on technology for providing DSM programming to natural gas customers. As stated in Exhibit C, Tab 1, Schedule 1, page 15, "where fuel switching away from natural gas aligns with the OEB's stated DSM objectives Enbridge Gas may pursue these activities."

[1] Paving the Road to 2030 and Beyond: Market transformation road map for energy efficient equipment in the building sector – Supporting the transition to a low-carbon economy, Energy and Mines Ministers' Conference (August 2018), p. 31. 18-00072-nrcan-road-map-eng.pdf

[2] Gas Absorption Heat Pumps, Technology Assessment and Field Test Findings, The Atmospheric Fund (TAF)(2018). TAF_GAHP-White-Paper_2018.pdf

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit D, Tab 1, Schedule 4

Preamble:

Enbridge includes the following table:

Table 1: 2023 TRC-Plus and Net Benefits /u

2023 TRC-Plus Forecast	TRC-Plus Benefits[1]	TRC Costs	Net Benefits[2]	TRC-Plus Ratio
Residential Program	**$125,706,884**	**$66,254,346**	**$59,452,537**	**1.90**
Residential Whole Home	$73,977,785	$46,006,919	$27,970,866	1.61
Residential Single Measure	$8,961,854	$7,529,043	$1,432,811	1.19
Residential Smart Home	$42,767,245	$11,229,960	$31,537,285	3.81
Program Level Admin		$1,488,425	-$1,488,425	
Commercial Program	**$133,540,929**	**$30,573,084**	**$102,967,845**	**4.37**
Commercial Custom	$103,530,272	$12,205,023	$91,325,250	8.48
Prescriptive Downstream	$8,696,432	$3,602,595	$5,093,837	2.41
Direct Install	$14,451,859	$5,764,458	$8,687,401	2.51
Prescriptive Midstream	$6,862,366	$5,691,921	$1,170,445	1.21
Program Level Admin		$3,309,088	-$3,309,088	
Industrial Program	**$210,099,973**	**$15,949,294**	**$194,150,679**	**13.17**
Industrial Custom	$210,099,973	$12,171,680	$197,928,293	17.26
Program Level Admin		$3,777,614	-$3,777,614	
Low Income Program	**$52,688,511**	**$20,090,692**	**$32,597,819**	**2.62**
Home Winterproofing	$22,736,285	$14,088,455	$8,647,829	1.61
Affordable Housing Multi-Residential	$29,952,226	$4,554,095	$25,398,132	6.58
Program Level Admin		$1,448,142	-$1,448,142	
Large Volume Program	**$12,904,860**	**$4,625,266**	**$8,279,594**	**2.79**
Direct Access	$12,904,860	$4,408,642	$8,496,218	2.93
Program Level Admin		$216,624	-$216,624	
Energy Performance Program	**$0**	**$584,156**	**-$584,156**	**0.00**
Whole Building Pay 4 Performance (P4P)[3]	$0	$530,000	-$530,000	0.00
Program Level Admin		$54,156	-$54,156	
Building Beyond Code Program		**$5,618,903**		
Low Carbon Transition Program		**$625,291**		
Program Subtotal	**$534,941,157**	**$144,321,033**	**$390,620,124**	**3.71**
Portfolio Costs		$18,360,000		
Portfolio Total	**$534,941,157**	**$162,681,033**	**$372,260,124**	**3.29**

1. Forecast 2023 TRC-Plus Benefits are calculated using 2021 Avoided Costs (best available information at the time of plan submission).
2. Net Benefits are the difference between the TRC-Plus Benefits and the TRC Costs.
3. Based on the program design, energy savings are not forecasted until Year 2 (2024).

Question(s):

(a) Please create a copy of the above table for each year over 2024-2027.

(b) Please reproduce this table for 2023 using the PAC/UCT test.

(c) In the previous DSM plan pre-filed evidence Enbridge included PAC/UCT test results. Why has it not done so here?

Response

a) Tables providing the TRC-Plus calculations for each year 2024 through 2027 follow below.

It should be noted as it relates specifically to the Whole Building Pay 4 Performance (P4P) program offering, which tracks and rewards participant savings over a 4-year period, budgets to support financial commitments made to participants for that period have been front loaded given the uncertainty surrounding precisely how and when (i.e., in which year over the multi-year engagement) the various participants will achieve performance levels. This has led to a fundamental disconnect between the in-year costs to support participants and the expected lifetime benefits realized over the duration of their engagement. This in turn has led to TRC Plus of <1 if only one year is assessed in isolation (as is the case in the 2024 Table illustrated below).

Enbridge Gas submits however that the following table, specific to the Whole Building P4P program offering more accurately reflects the estimated costs and expected savings at the 100% target level that will be realized by P4P participants, and the corresponding TRC-Plus ratio associated with their overall 4-year engagement.

2023-2026 TRC-Plus Forecast For 2023 Participants	TRC-Plus Benefits[1]	TRC Costs	Net Benefits[2]	TRC-Plus Ratio
Energy Performance Program	**$1,475,790**	**$1,209,156**	**$266,634**	**1.22**
Whole Building Pay 4 Performance (P4P)	$1,475,790	$1,155,000	$320,790	1.28
Program Level Admin		$54,156	-$54,156	

1. Forecast 2023 TRC-Plus Benefits are calculated using 2021 Avoided Costs (best available at the time of plan submission).
2. Net Benefits are the difference between the TRC-Plus Benefits and the TRC Costs.

Similar to other offerings, there is no consideration for participants entering the offering beyond the midpoint, so effectively the estimated TRC-Plus for participants beginning in 2023 and 2024 will be the same, but no values will be available for those beginning in 2025.

2024 TRC-Plus Forecast	TRC-Plus Benefits[1]	TRC Costs	Net Benefits[2]	TRC-Plus Ratio
Residential Program	**$128,780,095**	**$67,912,103**	**$60,867,993**	**1.90**
Residential Whole Home	$75,724,752	$46,986,632	$28,738,120	1.61
Residential Single Measure	$9,278,159	$7,970,749	$1,307,410	1.16
Residential Smart Home	$43,777,184	$11,466,297	$32,310,887	3.82
Program Level Admin		$1,488,425	-$1,488,425	
Commercial Program	**$135,768,222**	**$30,889,268**	**$104,878,954**	**4.40**
Commercial Custom	$105,684,198	$12,429,433	$93,254,765	8.50
Prescriptive Downstream	$8,520,209	$3,577,656	$4,942,552	2.38
Direct Install	$14,769,957	$5,856,363	$8,913,594	2.52
Prescriptive Midstream	$6,793,858	$5,716,728	$1,077,131	1.19
Program Level Admin		$3,309,088	-$3,309,088	
Industrial Program	**$207,777,779**	**$16,413,848**	**$191,363,930**	**12.66**
Industrial Custom	$207,777,779	$12,636,234	$195,141,544	16.44
Program Level Admin		$3,777,614	-$3,777,614	
Low Income Program	**$54,670,243**	**$20,345,060**	**$34,325,183**	**2.69**
Home Winterproofing	$23,775,208	$14,272,957	$9,502,251	1.67
Affordable Housing Multi-Residential	$30,895,035	$4,623,961	$26,271,074	6.68
Program Level Admin		$1,448,142	-$1,448,142	
Large Volume Program	**$13,162,958**	**$4,712,419**	**$8,450,538**	**2.79**
Direct Access	$13,162,958	$4,495,795	$8,667,162	2.93
Program Level Admin		$216,624	-$216,624	
Energy Performance Program	**$368,947**	**$740,406**	**-$371,459**	**0.50**
Whole Building Pay 4 Performance (P4P)	$368,947	$686,250	-$317,303	0.54
Program Level Admin		$54,156	-$54,156	
Building Beyond Code Program		**$5,618,903**		
Low Carbon Transition Program		**$625,291**		
Program Subtotal	**$540,528,243**	**$147,257,298**	**$393,270,945**	**3.67**
Portfolio Costs		$18,360,000		
Portfolio Total	**$540,528,243**	**$165,617,298**	**$374,910,945**	**3.26**

1. Forecast 2024 TRC-Plus Benefits are calculated using 2021 Avoided Costs (best available at the time of plan submission).
2. Net Benefits are the difference between the TRC-Plus Benefits and the TRC Costs.

2025 TRC-Plus Forecast	TRC-Plus Benefits[1]	TRC Costs	Net Benefits[2]	TRC-Plus Ratio
Residential Program	**$131,355,697**	**$69,545,938**	**$61,809,759**	**1.89**
Residential Whole Home	$77,239,247	$48,124,426	$29,114,821	1.60
Residential Single Measure	$9,463,723	$8,152,404	$1,311,318	1.16
Residential Smart Home	$44,652,727	$11,720,550	$32,932,177	3.81
Program Level Admin		$1,548,558	-$1,548,558	
Commercial Program	**$138,483,586**	**$31,511,991**	**$106,971,595**	**4.39**
Commercial Custom	$107,797,882	$12,618,010	$95,179,872	8.54
Prescriptive Downstream	$8,690,613	$3,655,252	$5,035,361	2.38
Direct Install	$15,065,356	$5,982,458	$9,082,899	2.52
Prescriptive Midstream	$6,929,735	$5,869,840	$1,059,895	1.18
Program Level Admin		$3,386,432	-$3,386,432	
Industrial Program	**$211,933,334**	**$16,831,153**	**$195,102,181**	**12.59**
Industrial Custom	$211,933,334	$12,900,924	$199,032,410	16.43
Program Level Admin		$3,930,229	-$3,930,229	
Low Income Program	**$55,763,647**	**$20,902,356**	**$34,861,291**	**2.67**
Home Winterproofing	$24,250,712	$14,657,628	$9,593,083	1.65
Affordable Housing Multi-Residential	$31,512,936	$4,738,081	$26,774,855	6.65
Program Level Admin		$1,506,647	-$1,506,647	
Large Volume Program	**$13,426,217**	**$4,812,128**	**$8,614,089**	**2.79**
Direct Access	$13,426,217	$4,586,752	$8,839,465	2.93
Program Level Admin		$225,376	-$225,376	
Energy Performance Program	**$0**	**$596,944**	**-$596,944**	**0.00**
Whole Building Pay 4 Performance (P4P)	$0	$540,600	-$540,600	0.00
Program Level Admin		$56,344	-$56,344	
Building Beyond Code Program		**$0**		
Low Carbon Transition Program		**$0**		
Program Subtotal	**$550,962,482**	**$144,200,511**	**$406,761,971**	**3.82**
Portfolio Costs		$19,101,744		
Portfolio Total	**$550,962,482**	**$163,302,255**	**$387,660,227**	**3.37**

1. Forecast 2025 TRC-Plus Benefits are calculated using 2021 Avoided Costs (best available at the time of plan submission).

2. Net Benefits are the difference between the TRC-Plus Benefits and the TRC Costs.

3. No benefits calculated as the Energy Performance program targets are to be reassessed at the mid-point assessment.

4. The Building Beyond Code and Low Carbon Transition budgets to be reassessed at the mid-point assessment. Not included in TRC forecast.

2026 TRC-Plus Forecast	TRC-Plus Benefits[1]	TRC Costs	Net Benefits[2]	TRC-Plus Ratio
Residential Program	**$133,982,811**	**$70,936,857**	**$63,045,954**	**1.89**
Residential Whole Home	$78,784,032	$49,086,914	$29,697,118	1.60
Residential Single Measure	$9,652,997	$8,315,452	$1,337,545	1.16
Residential Smart Home	$45,545,782	$11,954,961	$33,590,820	3.81
Program Level Admin		$1,579,529	-$1,579,529	
Commercial Program	**$141,253,258**	**$32,142,231**	**$109,111,027**	**4.39**
Commercial Custom	$109,953,839	$12,870,370	$97,083,469	8.54
Prescriptive Downstream	$8,864,425	$3,728,357	$5,136,068	2.38
Direct Install	$15,366,663	$6,102,107	$9,264,557	2.52
Prescriptive Midstream	$7,068,330	$5,987,237	$1,081,093	1.18
Program Level Admin		$3,454,160	-$3,454,160	
Industrial Program	**$216,172,001**	**$17,167,776**	**$199,004,225**	**12.59**
Industrial Custom	$216,172,001	$13,158,942	$203,013,059	16.43
Program Level Admin		$4,008,834	-$4,008,834	
Low Income Program	**$56,878,920**	**$21,320,404**	**$35,558,517**	**2.67**
Home Winterproofing	$24,735,726	$14,950,781	$9,784,945	1.65
Affordable Housing Multi-Residential	$32,143,194	$4,832,842	$27,310,352	6.65
Program Level Admin		$1,536,780	-$1,536,780	
Large Volume Program	**$13,694,741**	**$4,908,370**	**$8,786,371**	**2.79**
Direct Access	$13,694,741	$4,678,487	$9,016,254	2.93
Program Level Admin		$229,884	-$229,884	
Energy Performance Program	**$0**	**$608,883**	**-$608,883**	**0.00**
Whole Building Pay 4 Performance (P4P)[3]	$0	$551,412	-$551,412	0.00
Program Level Admin		$57,471	-$57,471	
Building Beyond Code Program[4]		**$0**		
Low Carbon Transition Program[4]		**$0**		
Program Subtotal	**$561,981,732**	**$147,084,521**	**$414,897,211**	**3.82**
Portfolio Costs		$19,483,779		
Portfolio Total	**$561,981,732**	**$166,568,300**	**$395,413,432**	**3.37**

1. Forecast 2026 TRC-Plus Benefits are calculated using 2021 Avoided Costs (best available at the time of plan submission).

2. Net Benefits are the difference between the TRC-Plus Benefits and the TRC Costs.

3. No benefits calculated as the Energy Performance program targets are to be reassessed at the mid-point assessment.

4. The Building Beyond Code and Low Carbon Transition budgets to be reassessed at the mid-point assessment. Not included in TRC forecast.

2027 TRC-Plus Forecast	TRC-Plus Benefits[1]	TRC Costs	Net Benefits[2]	TRC-Plus Ratio
Residential Program	**$136,662,468**	**$72,355,594**	**$64,306,873**	**1.89**
Residential Whole Home	$80,359,713	$50,068,653	$30,291,060	1.60
Residential Single Measure	$9,846,057	$8,481,761	$1,364,296	1.16
Residential Smart Home	$46,456,698	$12,194,061	$34,262,637	3.81
Program Level Admin		$1,611,120	-$1,611,120	
Commercial Program	**$144,078,323**	**$32,785,076**	**$111,293,247**	**4.39**
Commercial Custom	$112,152,916	$13,127,778	$99,025,139	8.54
Prescriptive Downstream	$9,041,714	$3,802,924	$5,238,789	2.38
Direct Install	$15,673,997	$6,224,149	$9,449,848	2.52
Prescriptive Midstream	$7,209,697	$6,106,981	$1,102,715	1.18
Program Level Admin		$3,523,243	-$3,523,243	
Industrial Program	**$220,495,441**	**$17,511,132**	**$202,984,309**	**12.59**
Industrial Custom	$220,495,441	$13,422,121	$207,073,320	16.43
Program Level Admin		$4,089,011	-$4,089,011	
Low Income Program	**$58,016,499**	**$21,746,812**	**$36,269,687**	**2.67**
Home Winterproofing	$25,230,440	$15,249,797	$9,980,644	1.65
Affordable Housing Multi-Residential	$32,786,058	$4,929,499	$27,856,559	6.65
Program Level Admin		$1,567,516	-$1,567,516	
Large Volume Program	**$13,968,636**	**$5,006,538**	**$8,962,098**	**2.79**
Direct Access	$13,968,636	$4,772,056	$9,196,580	2.93
Program Level Admin		$234,481	-$234,481	
Energy Performance Program	**$0**	**$621,060**	**-$621,060**	**0.00**
Whole Building Pay 4 Performance (P4P)[3]	$0	$562,440	-$562,440	0.00
Program Level Admin		$58,620	-$58,620	
Building Beyond Code Program[4]		**$0**		
Low Carbon Transition Program[4]		**$0**		
Program Subtotal	**$573,221,366**	**$150,026,211**	**$423,195,155**	**3.82**
Portfolio Costs		$19,873,455		
Portfolio Total	**$573,221,366**	**$169,899,667**	**$403,321,699**	**3.37**

1. Forecast 2027 TRC-Plus Benefits are calculated using 2021 Avoided Costs (best available at the time of plan submission).
2. Net Benefits are the difference between the TRC-Plus Benefits and the TRC Costs.
3. No benefits calculated as the Energy Performance program targets are to be reassessed at the mid-point assessment.
4. The Building Beyond Code and Low Carbon Transition budgets to be reassessed at the mid-point assessment. Not included in TRC forecast.

b) Please see PAC calculations for 2023 illustrated below.

2023 PAC Forecast	PAC Benefits[1]	PAC Costs	Net Benefits[2]	PAC Ratio
Residential Program	**$90,486,156**	**$40,804,802**	**$49,681,354**	**2.22**
Residential Whole Home	$55,600,714	$30,660,518	$24,940,196	1.81
Residential Single Measure	$6,057,621	$4,648,024	$1,409,597	1.30
Residential Smart Home	$28,827,821	$4,007,835	$24,819,986	7.19
Program Level Admin		$1,488,425	-$1,488,425	
Commercial Program	**$113,714,091**	**$25,262,775**	**$88,451,316**	**4.50**
Commercial Custom	$87,803,804	$12,330,350	$75,473,454	7.12
Prescriptive Downstream	$6,883,870	$2,436,237	$4,447,633	2.83
Direct Install	$12,770,457	$4,765,983	$8,004,474	2.68
Prescriptive Midstream	$6,255,961	$2,421,117	$3,834,844	2.58
Program Level Admin		$3,309,088	-$3,309,088	
Industrial Program	**$189,200,778**	**$17,828,114**	**$171,372,664**	**10.61**
Industrial Custom	$189,200,778	$14,050,500	$175,150,278	13.47
Program Level Admin		$3,777,614	-$3,777,614	
Low Income Program	**$45,670,186**	**$22,987,685**	**$22,682,501**	**1.99**
Home Winterproofing	$19,110,989	$14,375,115	$4,735,874	1.33
Affordable Housing Multi-Residential	$26,559,197	$7,164,428	$19,394,769	3.71
Program Level Admin		$1,448,142	-$1,448,142	
Large Volume Program	**$11,049,257**	**$2,766,624**	**$8,282,633**	**3.99**
Direct Access	$11,049,257	$2,550,000	$8,499,257	4.33
Program Level Admin		$216,624	-$216,624	
Energy Performance Program	**$0**	**$1,221,656**	**-$1,221,656**	**0.00**
Whole Building Pay 4 Performance (P4P)[3]	$0	$1,167,500	-$1,167,500	0.00
Program Level Admin		$54,156	-$54,156	
Building Beyond Code Program		**$8,437,503**		
Low Carbon Transition Program		**$4,590,841**		
Program Subtotal	**$450,120,468**	**$123,900,000**	**$326,220,468**	**3.63**
Portfolio Costs		$18,360,000		
Portfolio Total	**$450,120,468**	**$142,260,000**	**$307,860,468**	**3.16**

1. Forecast 2023 PAC Benefits are calculated using 2021 Avoided Costs (best available at the time of plan submission).

2. Net Benefits are the difference between the PAC Benefits and the PAC Costs.

3. Based on the program design, energy savings are not forecasted until Year 2 (2024).

Consistent with the proposed application of the TRC-Plus calculation for the P4P offering described in a), the following table represents a similarly modified PAC calculation.

2023-2026 PAC Forecast For 2023 Participants	PAC Benefits[1]	PAC Costs	Net Benefits[2]	PAC Ratio
Energy Performance Program	**$1,356,248**	**$1,221,656**	**$134,592**	**1.11**
Whole Building Pay 4 Performance (P4P)	$1,356,248	$1,167,500	$188,748	1.16
Program Level Admin		$54,156	-$54,156	

1. Forecast 2023 PAC Benefits are calculated using 2021 Avoided Costs (best available at the time of plan submission).

2. Net Benefits are the difference between the PAC Benefits and the PAC Costs.

c) In the previous (2015-2020 DSM Framework) the OEB outlined that the utilities should incorporate the PAC test as a secondary cost-effectiveness reference tool to help better inform which programs to propose. In its December 1, 2020 DSM Letter, the OEB stated, "the OEB expects that all programs continue to be cost-effective as defined in the Mid-Term Review Report."

In the Mid-Term Review Report, the OEB stated the following regarding cost-effectiveness:

> The OEB agrees that all material benefits of DSM should be recognized as part of the screening and cost-effectiveness analyses. As such, the OEB agrees that the cost of carbon should be added to the TRC-Plus cost effectiveness test. This will ensure that planning and cost-effectiveness analyses fully consider the costs and benefits of the DSM programs. The natural gas utilities should include the federal cost of carbon as part of future avoided cost updates, as it is the most relevant public data source currently available. The OEB will also include the cost of carbon in the cost-effectiveness analysis undertaken as part of the annual program evaluation work. Additionally, the OEB will maintain the non-energy benefit adder of 15% currently included in the TRC-Plus cost-effectiveness test. The OEB will further consider this topic as part of the post-2020 DSM framework development.[1]

Enbridge Gas followed the OEB's direction and reflected the same in the Proposed Framework, specifically that the enhanced TRC-Plus test, which includes the cost of carbon as part of avoided costs as well as a 15% adder for non-energy benefits be used for the purpose of screening DSM programs.

The new DSM Plan was submitted in accordance with the Proposed Framework and Enbridge Gas therefore provided TRC-Plus values as the OEB made no mention of PAC in their Mid-Term Report.

[1] EB-2017-0127 / EB-2017-0128, Report of the Ontario Energy Board, Mid-Term Review of the Demand Side Management (DSM) Framework for Natural Gas Distributors (2015-2020)(November 29, 2018), p. 28.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 2, Page 12

Preamble:

Enbridge's evidence includes this table:

Table 1: Whole Home Measure Incentives

Measure	Criteria	Incentive
Attic Insulation	Increase insulation from R35 or less to at least R60	$650
	Increase cathedral/flat roof insulation by at least R14	$650
Air Sealing	Achieve 10% or more above base target	$150
	Achieving base target	$100
Basement Insulation Must upgrade a minimum of 20 per cent of the total wall area	Add at least R23 insulation to 100% of basement	$1,250
	Add at least R12 insulation to 100% of basement	$750
	Add at least R23 insulation to 100% of crawl space wall	$1,000
	Add at least R12 insulation to 100% of crawl space wall	$500
	Add at least R23 insulation to 100% of floor above crawl space	$1,000
Exterior Wall Insulation Must upgrade a minimum of 20 per cent of the total wall area	Add at least R20 to 100% of building	$3,000
	Add at least R9 insulation to 100% of building to achieve a minimum of R12	$1,750
	Add at least R3.8 to 100% of building to achieve a minimum of R12	$1,000
Furnace/Boiler	For replacing a less than 96% AFUE natural gas furnace with a 96% AFUE or higher condensing natural gas furnace; OR, For replacing a less than 90% AFUE natural gas boiler with a 90% AFUE or higher condensing natural gas boiler.	$250 for furnace or $1,000 for boiler

Question(s):

(a) What is the expected life of a residential furnace for the purposes of estimating the cost-effectiveness of measures involving a furnace? If different, what is the expected life of a residential boiler for the purposes of estimating the cost-effectiveness of measures involving a furnace?

(b) Please provide a spreadsheet calculating the TRC cost-effectiveness of incentivizing a 96% AFUE furnace (incremental to the 95% AFUE standard). Please include all underlying assumptions and calculations. Please calculate the TRC ratio and TRC net costs/benefits.

(c) Please calculate the PAC/UCT for the $250 rebate discussed above.

(d) How many customers received the $250 rebate in 2018, 2019, and 2020?

(e) How many customers are forecast to receive the $250 rebate in 2023-2027

(f) Please provide the assumed annual gas consumption (m3) for an average customer with a 95% AFUE furnace versus an average customer with a furnace that received the $250 rebate discussed above.

(g) When calculating the cost-effectiveness of measures involving gas furnaces and boilers, does Enbridge use the manufacturer specifications for the AFUE? If no, please explain?

(h) Has Enbridge researched whether the manufacturer AFUE specifications accurately reflect the AFUE results in real-world applications? If yes, please provide a copy or link to all studies that have been consulted.

(i) Please provide a spreadsheet calculating the TRC cost-effectiveness of incentivizing a 90%+ AFUE boiler (incremental to the 90% AFUE standard). Please include all underlying assumptions and calculations. Please calculate the TRC ratio and TRC net costs/benefits.

(j) Please calculate the PAC/UCT for the $1,000 boiler rebate discussed above.

(k) How many customers received the $1,000 boiler rebate in 2018, 2019, and 2020?

(l) How many customers are forecast to receive the $1,000 boiler rebate in 2023-2027?

(m) Please provide the assumed annual gas consumption (m3) for an average customer with a 90% AFUE boiler versus an average customer with a boiler that received the $1,000 boiler rebate discussed above.

(n) Does a customer receive the $150 bonus incentive for three measures even if one of those measures is a gas furnace or boiler?

(o) Please provide the data that Enbridge has on the efficiency level of the gas furnaces and gas boilers of its customers. For example, please provide (a) an approximate average efficiency of customer gas furnaces, (b) the number of customers with gas furnaces, (c) the number of customers with furnaces within 5% efficiency ranges (e.g. 80-85, 85-90, 90-95 etc). Please also provide this information for boilers. Please provide a breakdown by customer type as possible (single family, etc.).

Response

a) The Whole Home offering is a whole home residential energy efficiency program offer and uses a measure life of 25 years.

b) By design, the Whole Home offering is a whole home performance program and uses NRCan's HOT2000 software to calculate the whole home savings (including interactive effects) across all measures undertaken. These whole home savings are used for cost effectiveness screening.

c) See response to part b.

d) The following DSM participants received the furnace rebate applicable for the program year:

	2018	2019	2020
L-EGD	13,037	14,257	8,777
L-UG	14,152	8,993	4,451
Total	27,189	23,250	13,228

e) Enbridge Gas cannot provide this information. The average rebates for the Whole Home offering for 2023-2027 are based on historical average incentive values at the whole home level, not at the individual measure level.

f) Unless a customer is a participant in one of our DSM programs, Enbridge Gas is unaware of the type of equipment that exists in a customer's home, and therefore is not able to complete this analysis.

g) See response to part b.

h) No, Enbridge Gas has not conducted research into accuracy of Seasonal Performance Ratings, such as “Annual Fuel Utilization Efficiency” (AFUE).

i) See response to part b.

j) See response to part b.

k) The following DSM participants received the boiler rebate applicable for the program year:

	2018	2019	2020
L-EGD	298	251	266
L-UG	187	116	130
Total:	485	367	396

l) See response to part e.

m) See response to part f.

n) Yes.

o) Please see Attachment 1, 2020 Residential Single Family Natural Gas End Use Survey. Furnace efficiency is categorized as high efficiency, medium efficiency or conventional based on the customer’s response. The survey does ask about boiler efficiency. The survey does not ask about water heater efficiency. It is important to note that this is a self-reported customer driven survey. Customers are asked a set of questions based on their best knowledge so equipment efficiency levels may not be accurate.

Residential: Single Family Natural Gas End Use Study

2020 Annual Results

Legacy Union Gas and Legacy Enbridge Gas Distribution

ENBRIDGE
Life Takes Energy®

Market Research & Analysis
Reported January 2021

Objectives

- To measure the penetration of natural gas appliances in the single family residential customer market;
- To understand customer perceptions of the levels of insulation in their home;
- To determine awareness of Enbridge Gas' energy conservation programs, and understand where customers turn to for more information.

Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 3 of 37

Methodology

- Sponsor-identified telephone interviews were completed by Leger between November 16 and December 12, 2020.
- Interviews were completed with customers who reside in single family dwellings and are (mainly) responsible for making energy-related decisions for the home.
- The total number of completed interview is 2,400 with 1,200 for each of LUG and LEG in total, and final franchise-wide results are calculated based on true geographic proportions.
- Overall results yield a margin of error of +/-2.8% at the 95% confidence interval.
- Unless otherwise noted, results in this report are based on all customers (EGI, comprised of LUG and LEG combined).
- The regions reported in this report are defined as follows:

Region Name	Includes	
Northern	Northeast, Northwest	LUG
LUG Eastern	Eastern	LUG
LEG Eastern	DMA 65	LEG
GTA West & Niagara	DMA 76, DMA 53, DMA 21	LEG
Toronto	DMA 01	LEG
GTA East	DMA 35, DMA 45, DMA 47	LEG
Southeast	Waterloo/Brantford, Hamilton/Halton	LUG
Southwest	Windsor/Chatham, Sarnia/London	LUG

Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 4 of 37

Executive Summary (1 of 2)

Natural Gas Penetration

- Natural gas remains the top choice for home heating and water heating, with natural gas water heating showing a slight uptick in 2020.
- When asked to think about a new home, barring any other considerations, most customers continue to choose natural gas, though a small, but growing, proportion would choose alternate sources, such as geothermal or solar for home and water heating, respectively.
- The prevalence of natural gas in secondary appliances is quite consistent over the last few years, with increases compared to last year for natural gas fireplaces and barbecues. Across secondary appliances some regional variation continues to exist.

Ownership

- Furnace ownership continues to be very high (89%), though rental rates are a bit higher among newer homes and among younger customers. Overall, in the case of future ownership, most customers intend to own (92%).
- Ownership of water heaters remains steady over the last several years for LUG customers and is similar among LEG customers. It continues to remain much lower than furnace ownership. Among those who are at least fairly likely to replace their water heater in the next 2 years, interest in ownership is much stronger (63%) than current ownership (43%).

Furnace Efficiency

- With a different approach to asking customers about the efficiency level of their furnace in 2020 we see a higher proportion of customers report that their furnace is high-efficiency.
- Still, a sizable group of customers do not know the efficiency level of their furnace (this has not changed much over the last decade) – customers who don’t know are not likely to be aware of and act on the potential for upgrades.
- There is a continued increase in the proportion of customers who have a Smart Thermostat (23%) as customers upgrade their thermostats; about 1-in-3 customers with a programmable or Smart thermostat actively program it to reduce energy consumption.

Executive Summary (2 of 2)

Insulation

- About 2-in-5 customers (41%) deem their house to be “well insulated” while 6% indicate it is “poorly insulated” or “not insulated,” which varies by the age of the home. 15% of customers indicate that they don’t know the level of insulation for their home, while for draftiness the proportion of “don’t know” is much lower at 4%.
- While a third of customers whose home is not “well” insulated would not bother improving their insulation, another third would to “save money on utility bills” or to “increase comfort” in the home.

Energy Efficiency (EE) and DSM offerings

- The proportion of customers planning to make energy efficiency updates is down to 18% at the end of 2020 (down from 25% in 2019).
- Awareness that Enbridge Gas offers energy conservation programs sits at 67% among LUG customers and at 52% among LEG customers – this varies by customer age group and region.
- Overall customer awareness of the HWP and HER programs remains quite strong at 25% and 36%, respectively. Among all customers, 34% are aware of the rebates and discounts on a Smart Thermostat. Among those aware of the respective programs, 14% have participated in HWP and 27% in HER.
- Though decreasing over time, the internet continues to be the most important source of general energy efficiency information – highlighting the importance of digital marketing and strong website content. Contractor / supplier is being mentioned more often (up to 16% from 6% in 2019).

Overview of Natural Gas (NG) Appliances

- Year over year, natural gas use for all major appliances is mostly unchanged except for natural gas fireplaces and barbecues, which are both up compared to last year.
- Across legacy franchises natural gas for home heating is just slightly higher in LEG compared to LUG, and the use of natural gas for clothes dryers continues to be significantly higher in LUG.

Natural Gas Penetration Rates across Appliances

	2014	2015	2016	2017	2018	2019			2020		
			LUG			EGI	LUG	LEG	EGI	LUG	LEG
Home Heating	96%	96%	95%	96%	94%	96%	95%	97%*	96%	96%	97%
Water Heater	85%	86%	86%	83%	82%	82%	80%	83%	85%	83%	86%
Fireplace	38%	41%	44%	36%	42%	35%	38%*	33%	42%	43%	42%
Cooktop/Stove	29%	26%	31%	29%	31%	30%	29%	30%	31%	30%	32%
Barbecue	27%	23%	26%	20%	24%	24%	23%	24%	27%	28%	25%
Clothes Dryer	21%	20%	19%	17%	19%	16%	20%*	13%	15%	17%*	13%
Pool Heater	(--)	(--)	(--)	(--)	5%	6%	5%	6%		(--)	

(--) = was not measured

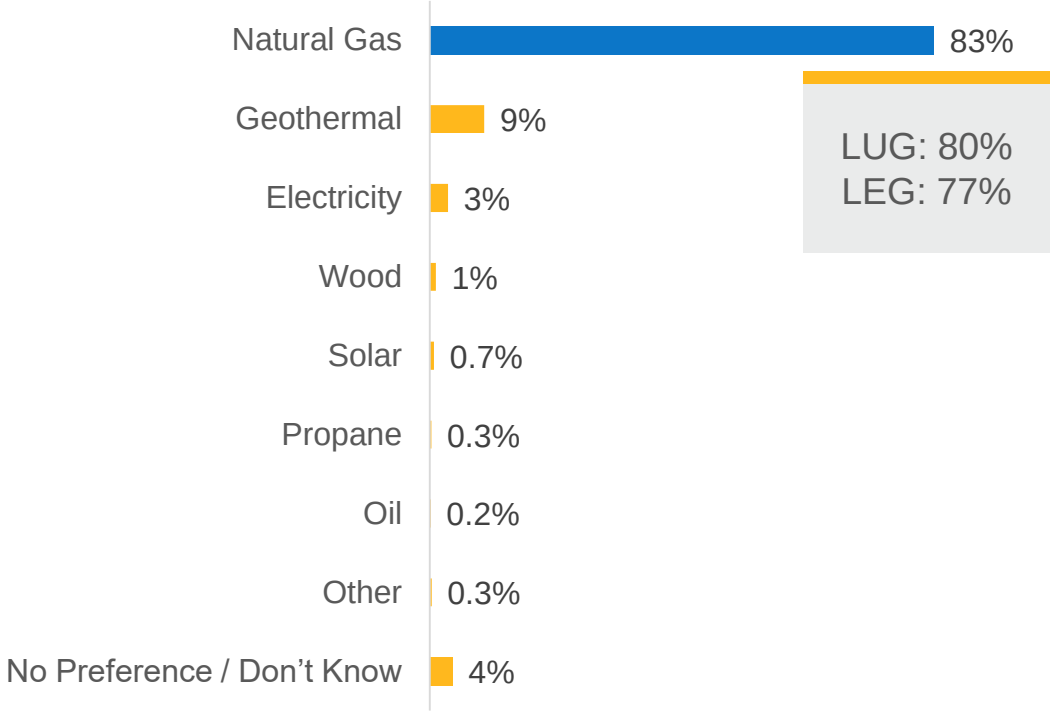
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Home Heating: Preference

- Most customers (83%) would prefer natural gas for home heating in a new home (down from 86% in 2019), followed by geothermal (9%) and electricity (3%). Preference for natural gas is strongest in the Southwest (88%), while lowest in the Toronto (79%) region.
- Key reasons for choosing an alternate fuel source include the perception that it is more environmentally friendly / energy efficient (especially for geothermal) and has lower operation costs. Also, electricity is deemed to be safer by some customers.

Preferred Fuel Source for Home Heating

(Base: all customers, n=2,400)



Reason for Preferred Fuel Source

(Base: all customers who indicated a preferred fuel source)

	Natural Gas (n=1,992)	Electricity (n=62)	Geothermal (n=204)
Lower operation cost	57%	17%	29%
Environmentally friendly / Energy efficient	26%	25%	68%
Easier / More convenient	22%	19%	4%
It is what I am used to / Used in the past	17%	13%	2%
Reliable / Dependable heat source/ Best option	9%	2%	4%
More heat generated / It's warmer	4%	5%	2%
Safer / Safety concerns	4%	5%	1%
It is what is available/ Preferred source not available	0%	0%	1%
Other	1%	4%	3%
DK/NA/Refused	4%	13%	5%

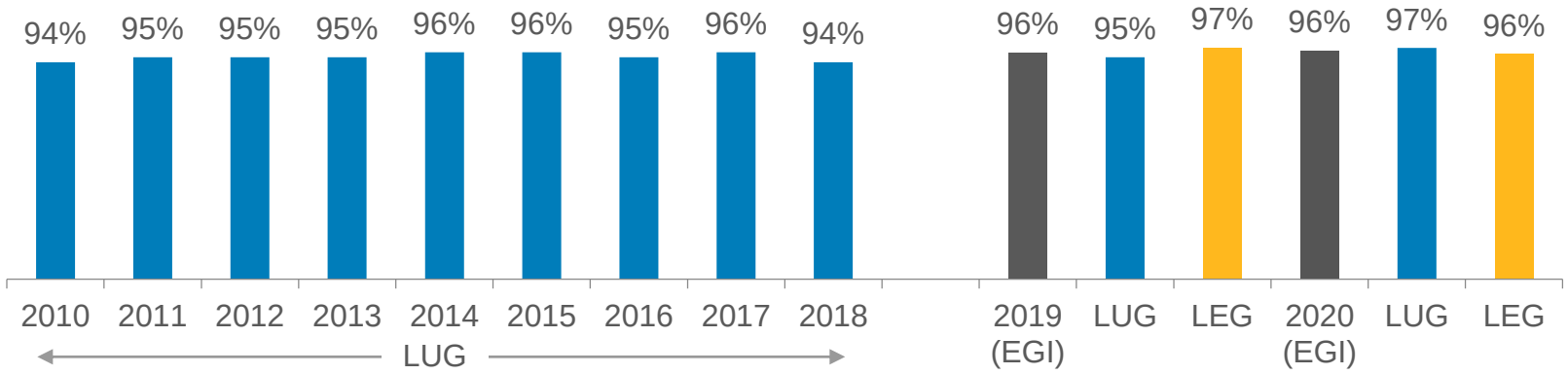
Q: I would now like you to assume that you are moving into a new home. Which energy source would you choose for each of the following? PRIMARY home heating Q: What would you say are your main reasons for choosing (insert choice) as your primary source for your home heating? (Total mentions)

Home Heating: NG Adoption & Equipment

- Natural gas forced air furnaces continue to be the most used heating equipment across the franchise.
- A sizable portion of customers are not aware of the specific type of heating equipment they have in their home (1-in-10 among those who heat with natural gas)
- Those who don't use natural gas for home heating may use electricity (3%) followed by only handfuls in the sample of customers who heat with wood, propane, or oil.

Natural Gas Penetration: Home Heating

(Base: all customers)



Type of Natural Gas Heating Equipment (n=2,297)	
Forced Air	83%
Hydronic	4%
Space Heaters	0%
Combination	2%
Hybrid or dual-fuel system of a forced air furnace and electric air source heat pump	1%
Don't Know	10%

Type of Electric Heating Equipment (n=61)	
Forced Air	54%
Baseboard Heaters	17%
Air Source Heat Pumps	0.4%
A hybrid or dual-fuel system of a forced air furnace and electric air source heat pump	0.4%
Electric boiler (radiator)	2%
Other	9%
Don't Know	17%

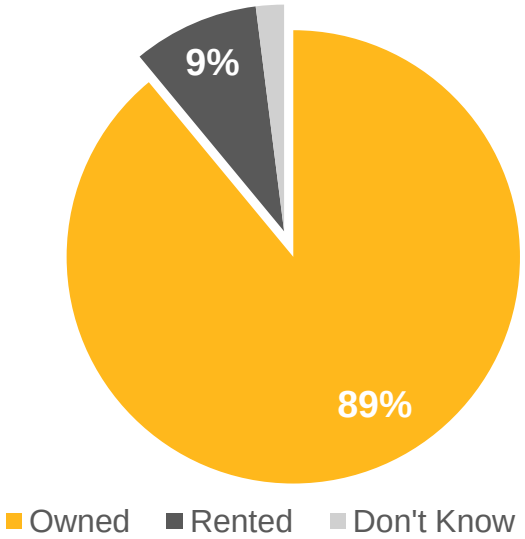
Q: What is the MAIN energy source for heating your home? Q: What type of **(PROPANE/NATURAL GAS/OIL)** furnace or heating system do you have? Q: What type of electric system are you using to heat your home?

Home Heating: Furnace Ownership

- Most customers own their furnace (or heating system), and most customers who anticipate replacing their furnace or heating system in the future would continue to own it (rather than rent it).
- Rental rates are higher among some customer groups, including households that also rent the water heater (12%), in homes built since 2000 (13%), those with incomes of $80K-$100K (14%) and among younger (18-34) customers (12%).

Ownership of Current Furnace / Heating System

(Base: customers who use electricity, natural gas or oil for home heating, n=2,363)

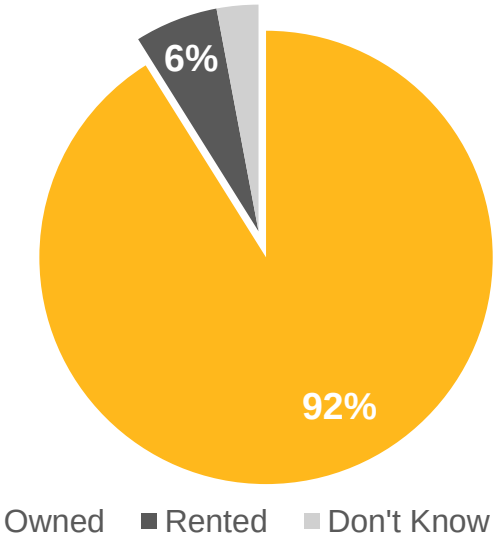


Region	Owns (%)
Northern	90%
LUG Eastern	89%
LEG Eastern	91%
GTA West & Niagara	87%
Toronto	89%
GTA East	89%
Southeast	88%
Southwest	93%*

Among younger customers (age 18-34) ownership level is lower at 85% compared to their counterparts, especially those age 55-64 (93%)

Ownership of Replacement Furnace / Heating System

(Base: customers who are at least fairly likely to replace their furnace n=258)



Q: Is your furnace or heating system owned or rented? Q: Is your replacement furnace or heating system most likely to be owned or rented?

* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Home Heating: Age and Efficiency Levels

- Most forced air furnaces are less than 10 years old (68%) with 2-in-5 of those whose furnace is less than 5 years old indicating that they replaced it in the last 2 years, with about half of those also replacing their air conditioner at the same time.
- The Northern region has a larger proportion of older furnaces, specifically those aged 16-20 years (15%) compared to the average (8%).
- When asked about furnace efficiency most indicated that their furnace is high efficiency, and with a change in the question this year (using the age of furnace as a starting point) this proportion is higher than in previous years and should be interpreted with caution.

Age of Forced Air Furnace (all fuels)	
5 years or less	39%
6 to 10 years	29%
11 to 20 years	23%
More than 20 years	4%
Don't Know	4%

40% of those who currently have a furnace that is less than 5 years old have replaced it in the last 2 years (or 13% of the total)

50% of customers who replaced their furnace in the past 2 years and also had an air conditioner also replaced it at the same time

92% of customers whose furnace is less than 10 years old indicate that their furnace is high-efficiency

66% of customers whose furnace is more than 10 years old indicate that their furnace is high-efficiency, among the remainder, 14% indicate having a mid-efficiency furnace and 15% a conventional furnace (5% indicate "don't know")

Fuel Source for Original (replaced) Furnace	
Natural Gas	91%
Electricity	2%
Oil	4%
Other	1%
Don't Know	2%

Forced Air Furnace Efficiency (natural gas)*	
High efficiency (over 90% efficiency)	82%
Medium efficiency	4%
Conventional (less than 75%)	4%
Don't Know	11%

Q:How old is your furnace? Q: Is this a high-efficiency furnace? IF NEEDED: it would likely have one or two plastic vent pipes (often white) that vent out a side wall. Q: What would you say the efficiency level of your furnace is? Would it be a high-efficiency furnace that vents through the side of the house, like dryer, but with a smaller plastic pipe? Q: Is it a furnace with a metal chimney coming up through the roof, such as a conventional furnace (which has a continuously lit pilot light) or a mid-efficiency furnace (which does not have a pilot light)?

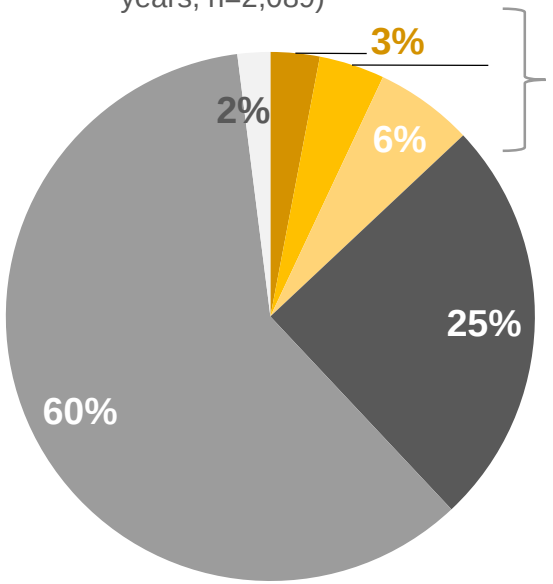
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 11 of 37

Home Heating: Furnace Replacement

- A small proportion of customers (12%) indicate that they are at least likely to replace their furnace in the next year because it is likely to break down – among them most would get a natural gas furnace.

Likely to Replace Furnace in Next 2 Years

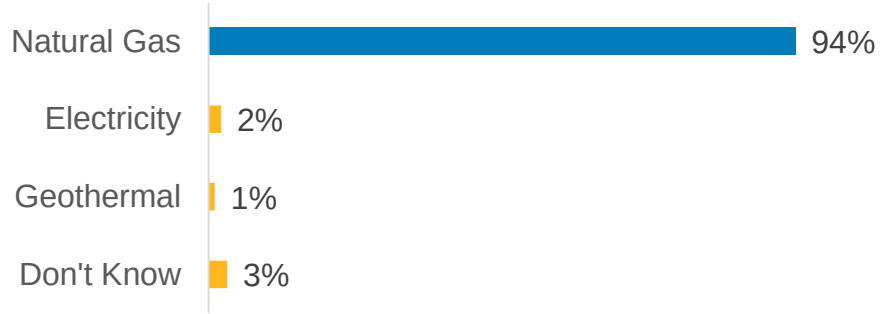
(Base: customers who have not replaced their furnace in the past 2 years, n=2,089)



12% at least fairly likely
LEG: 12%
LUG: 13%

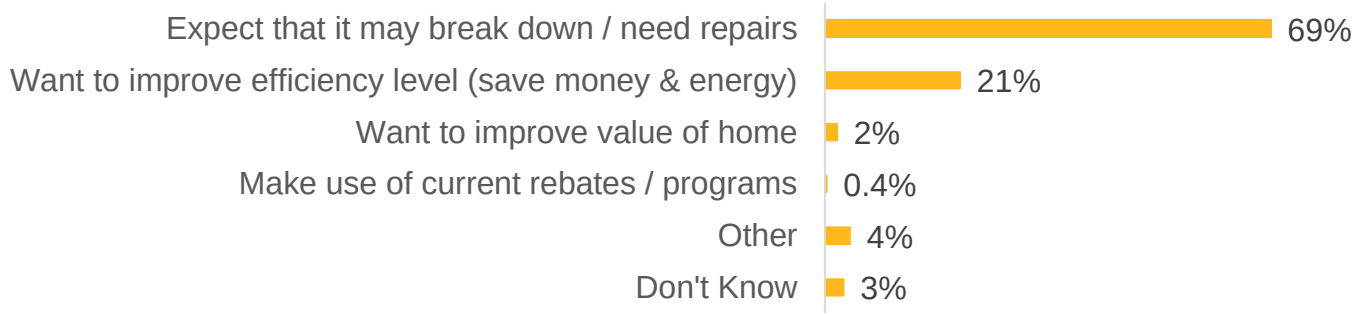
Fuel Source of New Furnace

(Base: customers who are at least fairly likely to replace their furnace n=258)



Reason For Replacing Furnace

(Base: customers who are at least fairly likely to replace their furnace n=258)



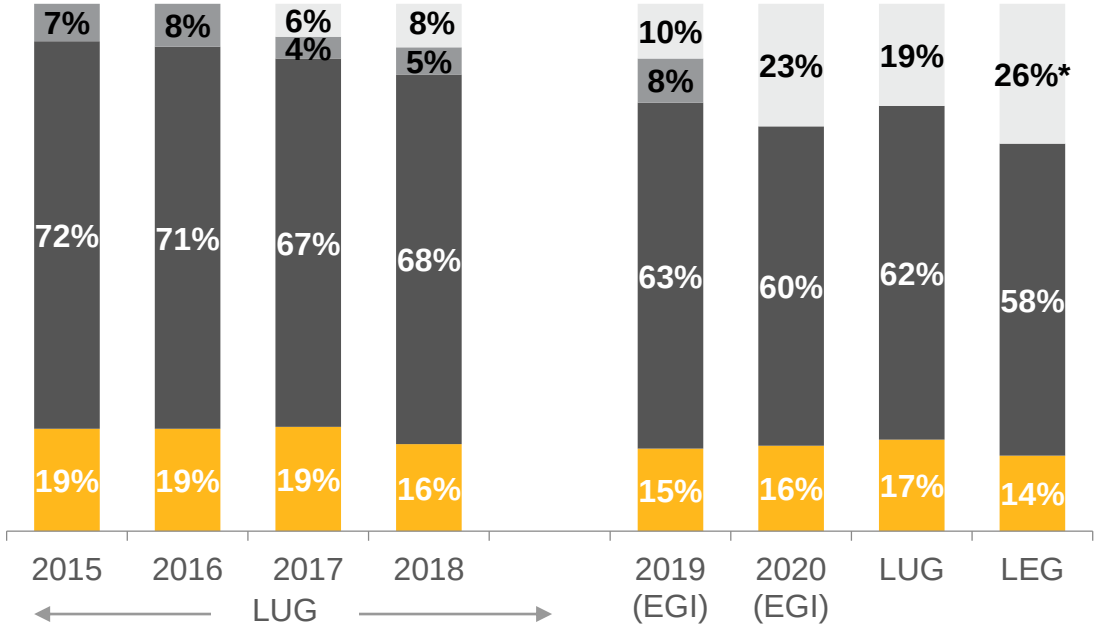
Q:How likely are you to replace the furnace or home heating system in the next 2 years? Q: Which energy source will the new furnace or heating system use? Q: What would you say is the main reason that you are fairly/very/extremely likely to replace your furnace or home heating system?

Home Heating: Thermostats

- Smart thermostats continue to gain in popularity. They are most popular in the GTA East area (30%), in newer homes (30%), and among higher earning households (41%), and younger customers (39%).
- Non-programmable thermostats appear disproportionately among customers in the Northern (27%) and Toronto (22%) regions, and in older (22%), smaller (20%), lower income (23%), and senior (22%) occupied homes. Opportunities to upgrade thermostats continue to exist, as well as opportunities to encourage customers to actively program their thermostats.

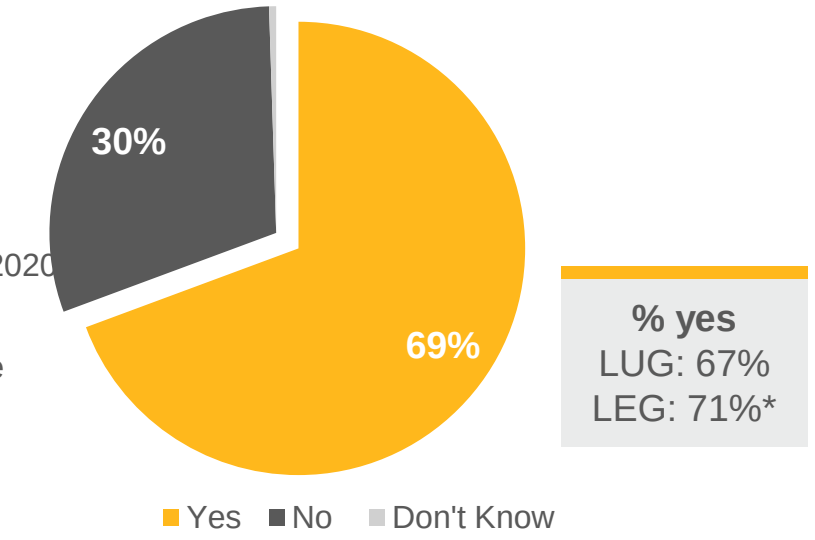
Type of Thermostat

(Base: all customers, n=2,400)



Actively program thermostat to help reduce energy use

(Base: all customers with Smart or Programmable thermostat, n=2,354)



Q: Which of the following thermostats do you have? Q: Do you actively program your thermostat to help reduce your energy use? Response options changed in 2017, and again changed in 2020.

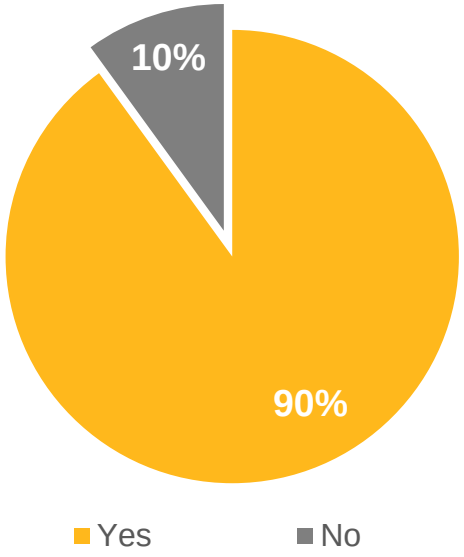
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Air Conditioning

- There is considerable variation across the franchise ranging from 93% among LEG customers to 86% among LUG customers, and from 62% in the Northern region to 95% in the GTA East region in terms of whether a customer has air conditioning or not.
- Air conditioning is also significantly more common in newer houses with 98% of homes built since 2000 having air conditioning vs. only 75% of homes built before 1950. Proportions are similar by income with air conditioning in 98% of households earning at least $140K vs. 82% of households earning less than $40K.

Have Air Conditioning

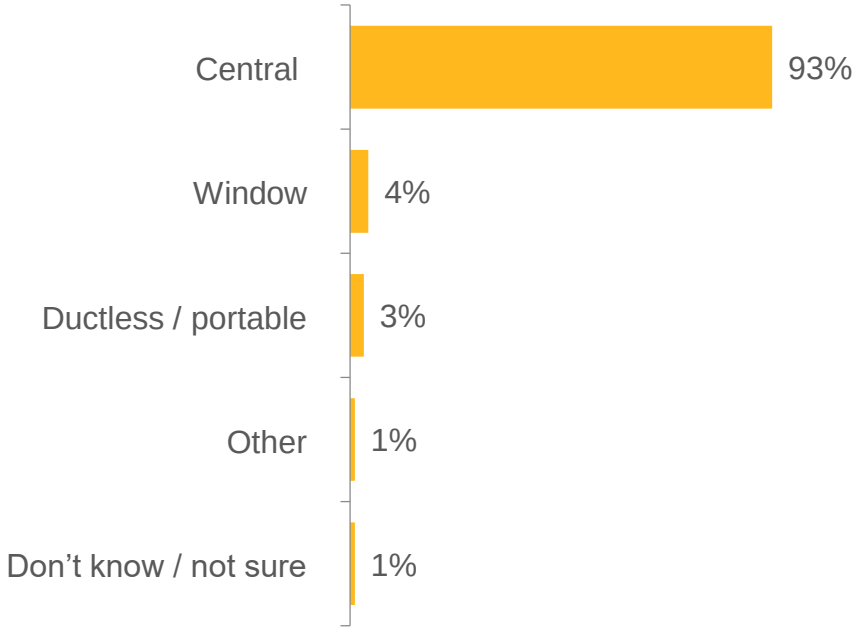
(Base: all customers, n=2,400)



Region	Yes (%)
Northern	62%
LUG Eastern	85%
LEG Eastern	93%
GTA West & Niagara	93%*
Toronto	89%
GTA East	95%*
Southeast	91%
Southwest	93%

Type of Air Conditioning

(Base: customers who have air conditioning, n=2,158)



Q: Do you have air conditioning in your home? Q: Which of the following types of air conditioning do you use in your home?

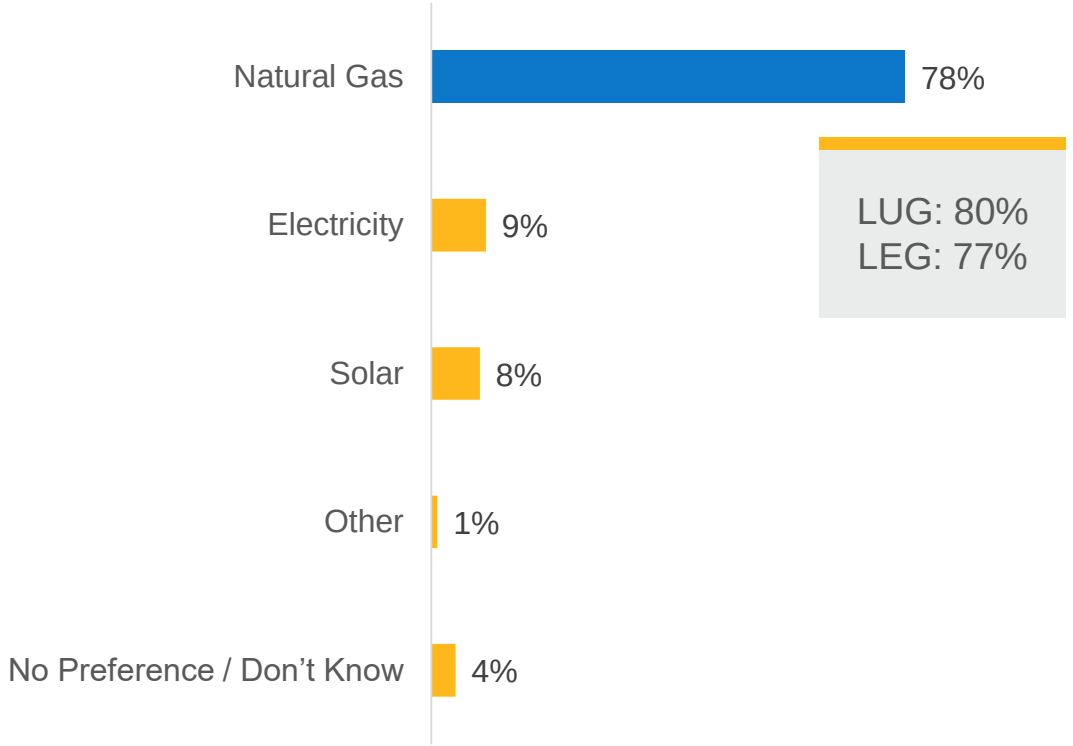
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Water Heating: Preference

- Most customers (78%) would prefer natural gas for water heating in a new home (down from 81% in 2019), followed by electricity (9%) and solar (8%). The preference for natural gas is slightly higher among LUG customers, and regionally is highest in the Northern (86%) and Southwest (83%) regions.

Preferred Fuel Source for Water Heating

(Base: all customers, n=2,400)



Region	Natural Gas (%)
Northern	86%*
LUG Eastern	72%
LEG Eastern	76%
GTA West & Niagara	78%
Toronto	75%
GTA East	77%
Southeast	77%
Southwest	83%*

Q: I would now like you to assume that you are moving into a new home. Which energy source would you choose for each of the following? Water heater?
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

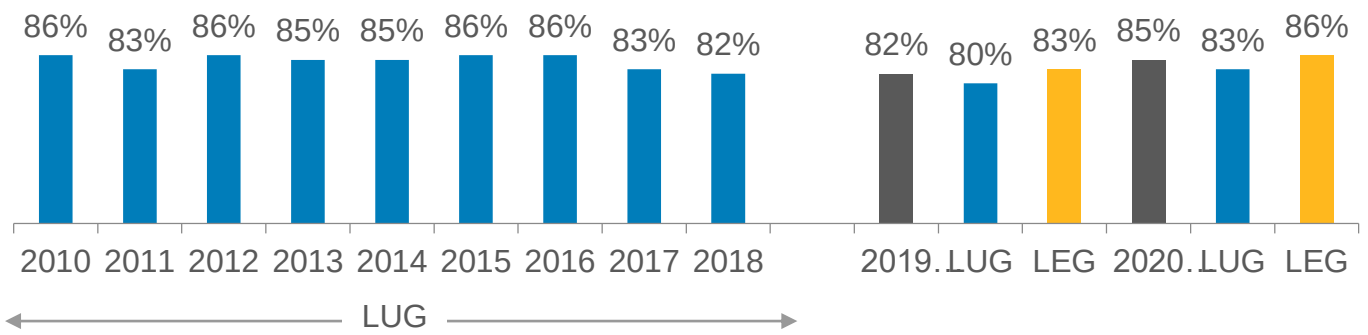
Residential: Single Family Natural Gas End Use Study

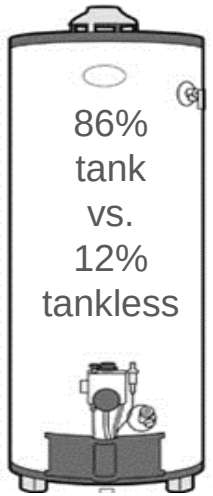
Water Heating: NG Adoption & Equipment

- Penetration of natural gas water heaters has dropped slightly over the past few years among LUG customers, though is a bit higher in 2020 compared to 2019. Natural gas use for water heating ranges from 70% in LUG's Eastern region to 89% in the Southwest and 88% in the GTA West and Niagara regions.
- The proportion of tankless water heaters continues to grow slowly up from 6% in 2017 to 11% in 2019, and 12% in 2020.

Natural Gas Penetration: Water Heating

(Base: all customers)





Age of Water Heater (all)	
5 years or less	50%
6 to 10 years	29%
11 to 15 years	10%
More than 15 years	4%
Don't Know	6%

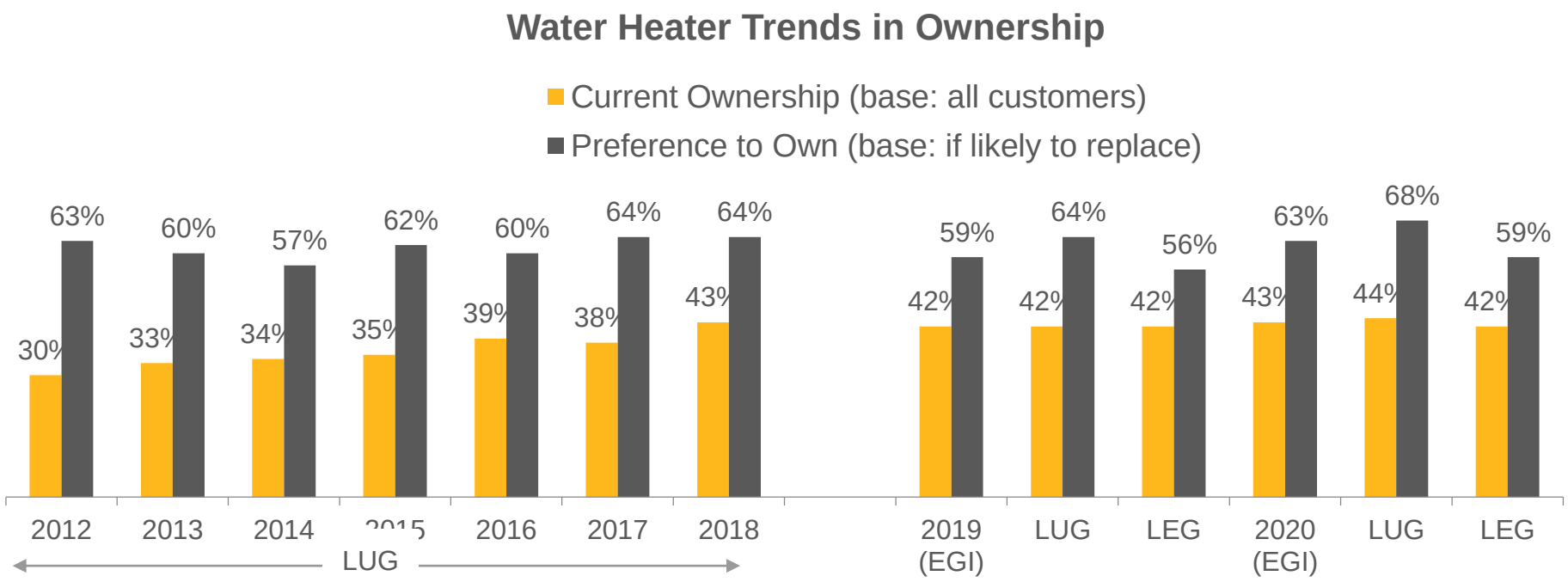
Region	Tankless (%)
Northern	13%
LUG Eastern	14%
LEG Eastern	11%
GTA West & Niagara	8%
Toronto	15%
GTA East	14%
Southeast	11%
Southwest	14%

Q: What type of water heater do you have? Is it...? Q: How old is your water heater? Q: Does your water heater have a tank or is it tankless? IF NEEDED READ *Tankless water heaters are also called continuous or instantaneous water heaters.*

Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 16 of 37

Water Heating: Ownership

- Current ownership is the same among LUG and LEG customers and is quite consistent for LUG over the last couple of years.
- Ownership tends be higher among customers who have an electric water heater compared to one that is fueled by natural gas.
- Future intentions continue to lean toward ownership - 63% plan to own, (68% among LUG customers and 59% among LEG customers).



Owned % by type of water heater
Natural Gas: 40%
Electricity: 54%

Q: Is your water heater owned or rented? Q: Is your replacement water heater most likely to be owned or rented?

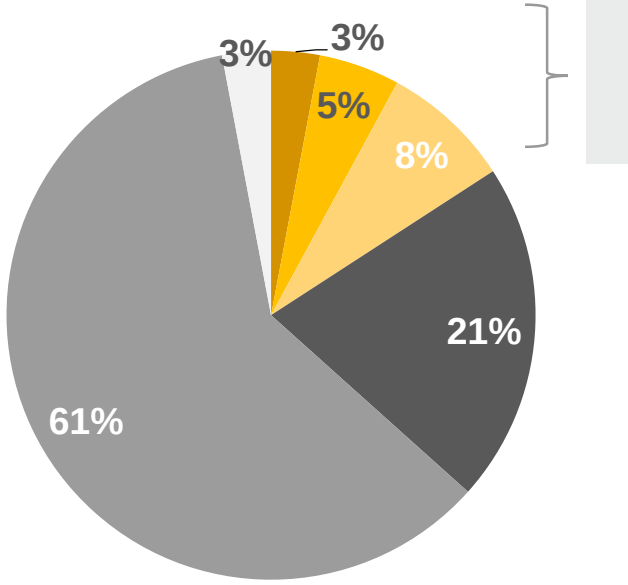
Residential: Single Family Natural Gas End Use Study

Water Heating: Replacement

- Similar to furnaces, a small proportion of customers (15%) indicate that they are at least likely to replace their water heater in the next 2 years because it is likely to break down or because they're looking to improve the efficiency level – among them, most would get a natural gas water heater.

Likely to Replace Water Heater in Next 2 Years

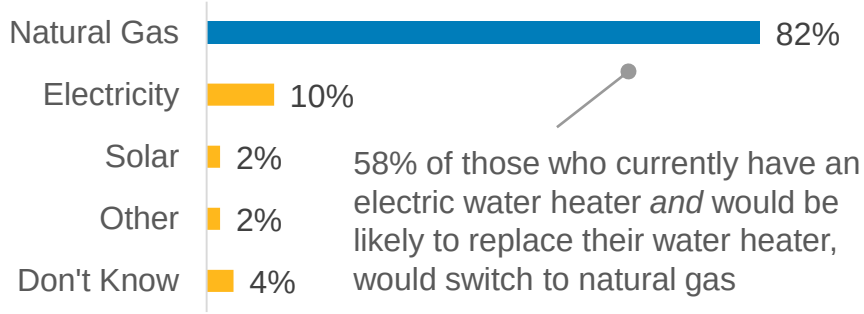
(Base: customers who have a water heater and own their home n=2,210)



15% at least fairly likely
LEG: 16%
LUG: 15%

Fuel Source of New Water Heater

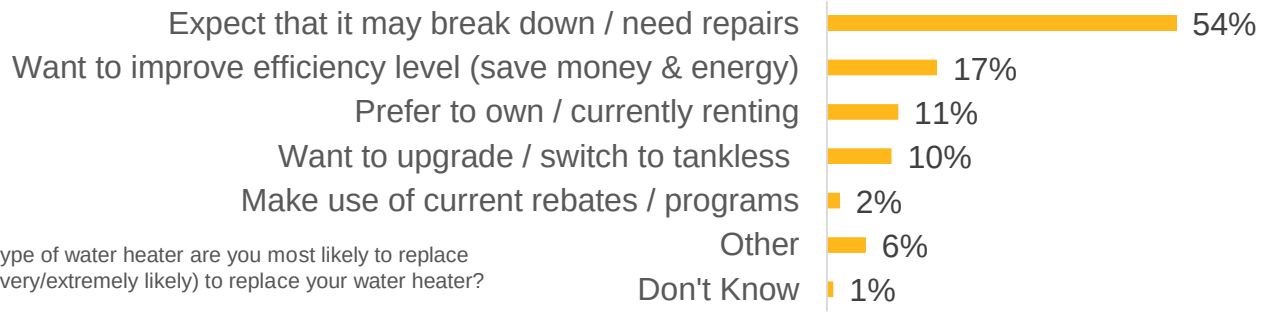
(Base: customers who are at least fairly likely to replace their water heater n=342)



58% of those who currently have an electric water heater *and* would be likely to replace their water heater, would switch to natural gas

Reason For Replacing Water Heater

(Base: customers who are at least fairly likely to replace their water heater n=342)



Q: How likely are you to replace your water heater in the next 2 years? Are you...? Q: What type of water heater are you most likely to replace your current water heater with? Q: What would you say is the main reason that you are (fairly/very/extremely likely) to replace your water heater?

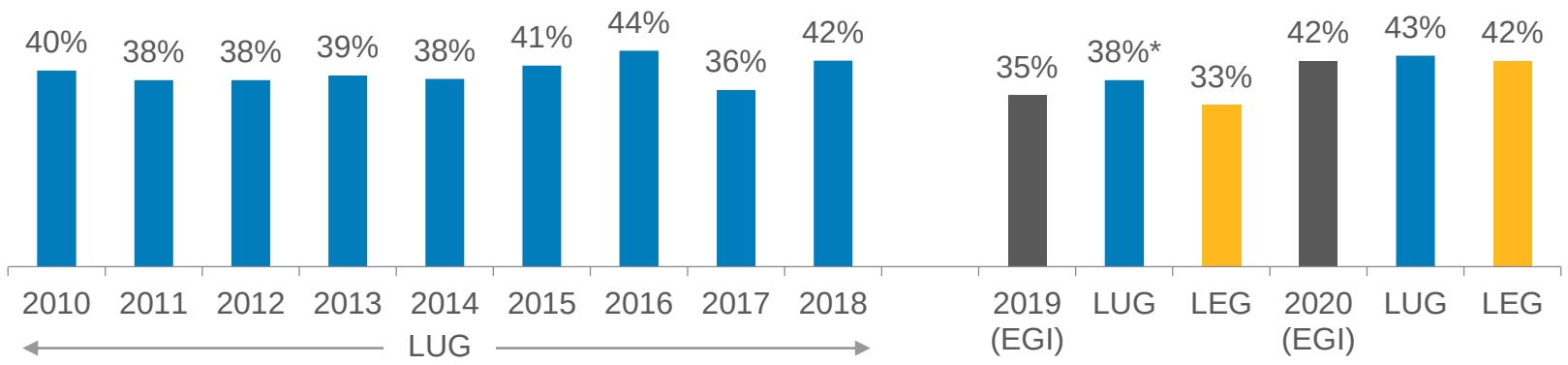
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 18 of 37

Fireplaces: NG Adoption & Equipment

- More LEG customers (62%) have fireplaces compared to LUG customers (53%). Natural gas fireplaces continue to be popular among those who have a fireplace or would like to install one (interest in electric fireplaces is increasing, up from 13% in 2019).
- Just over half of customers with a fireplace indicate that they use it for supplementary heating, while 1-in-3 indicate they use it for ambiance.

Natural Gas Penetration: Fireplaces

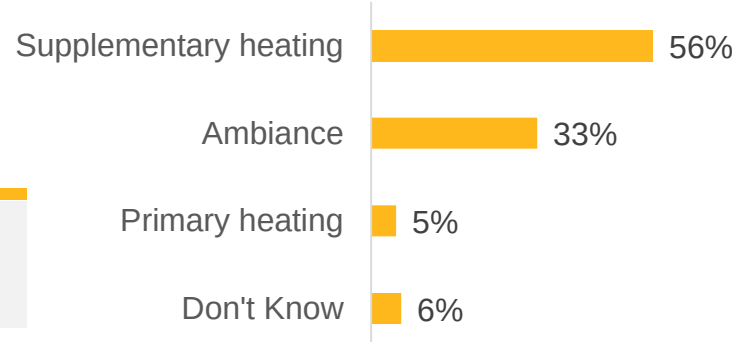
(Base: all customers)



8% are at least fairly **likely to install a fireplace** in the next 2 years, and among them 70% would install one that uses **natural gas**, 17% would use electricity and 7% would use wood as a fuel source

Use of Natural Gas Fireplace

(Base: customers who have natural gas fireplace, n=1,015)



59% of households have a fireplace

- 77% have just one
- 22% have 2 or more

Fuel Type: 72% 27% 8%

Age of Fireplaces (all)

1-in-3 (33%) fireplaces are less than 10 years old

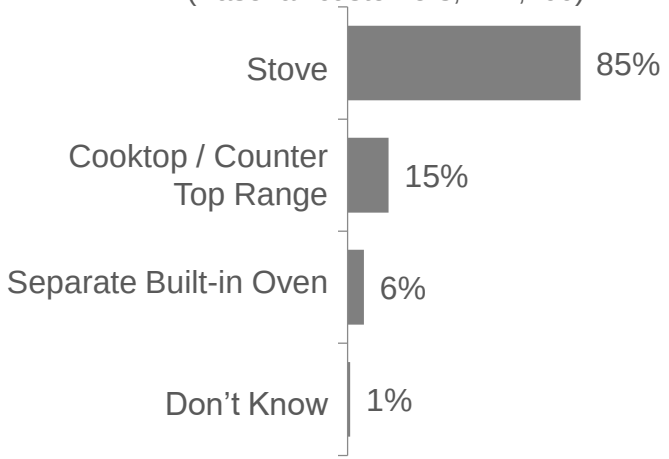
Q: Are there any indoor working fireplaces in your home? Q: How many indoor working fireplaces do you have in your home? Q: How old is (EACH)? Q: And which energy source does (EACH) use? Q: How likely are you to install an indoor fireplace in your home in the next 2 years? Are you... Q: And what type of indoor fireplace are you most likely to install? Q: Which of the following best describes how you use your natural gas fireplace(s)?

Cooking: NG Adoption & Equipment

- At 31%, penetration of natural gas for indoor cooking continues to be relatively stable. While similar across franchise areas, regionally differences exist, with the Northern (19%) and LUG Eastern (19%) regions being least likely to use natural gas for cooking while Toronto (42%) and the Southwest (39%) regions being most likely to.
- Both natural gas fuelled stoves and counter top ranges are the most prevalent in the highest earning households (37%, 57%), and the largest homes (in sq ft) (41%, 54%),

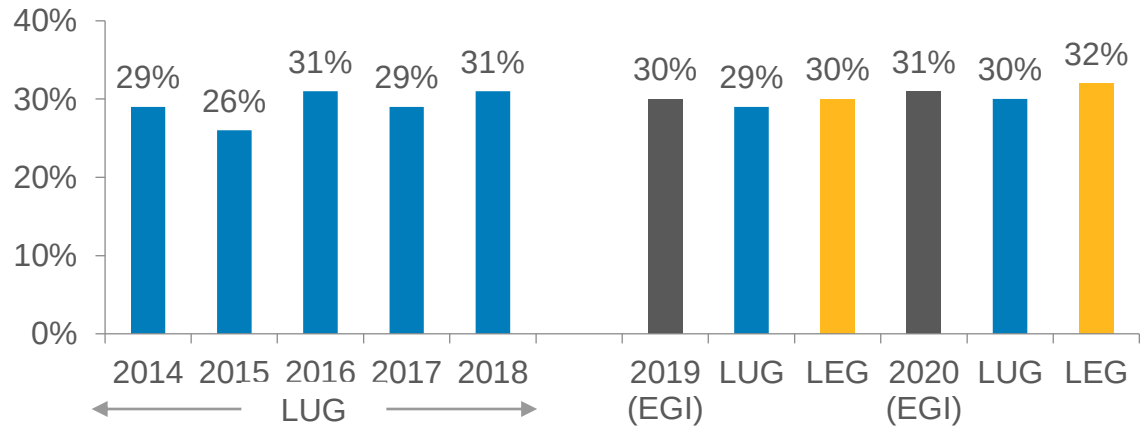
Type of Cooking Equipment (more than one response allowed)

(Base: all customers, n=2,400)



Natural Gas Penetration: Cooktop/Stove

(Base: all customers)



Region	Natural Gas (%)
Northern	19%
LUG Eastern	19%
LEG Eastern	23%
GTA West & Niagara	31%
Toronto	42%*
GTA East	28%
Southeast	30%
Southwest	39%*

Q: Do you have a stove, or do you have a cook top with a separate oven? *Q:* Is your (ITEM) fueled by natural gas or electricity?

* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 20 of 37

Clothes Dryer: NG Adoption & Equipment

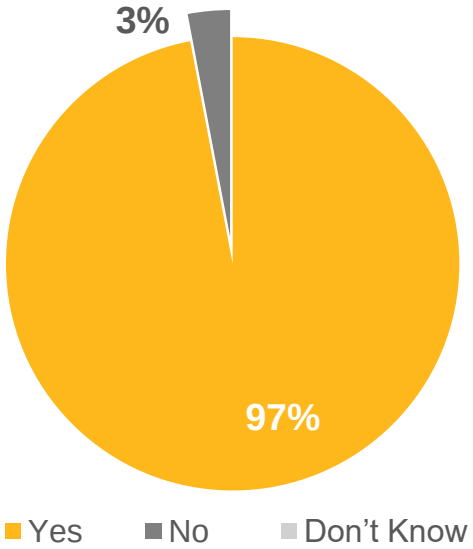
- Almost all single-family homes have a clothes dryer (97%) with electricity being used by most across the franchise (85%) followed by natural gas (15%), with significant differences between LUG and LEG.
- Significantly more dryers in the Southwest region are fueled by natural gas compared to other regions.
- Households that own natural gas water heaters are more likely to have natural gas clothes dryers, while newer homes are less likely to have a natural gas dryer (11%) compared to older homes.

Region	Natural Gas (%)
Northern	9%
LUG Eastern	11%
LEG Eastern	8%
GTA West & Niagara	13%
Toronto	16%
GTA East	12%
Southeast	18%
Southwest	23%*

Age of Home	Natural Gas (%)
Before 1950	20%*
1950-1969	17%
1970-1989	15%
1990-1999	15%
2000-2020	11%

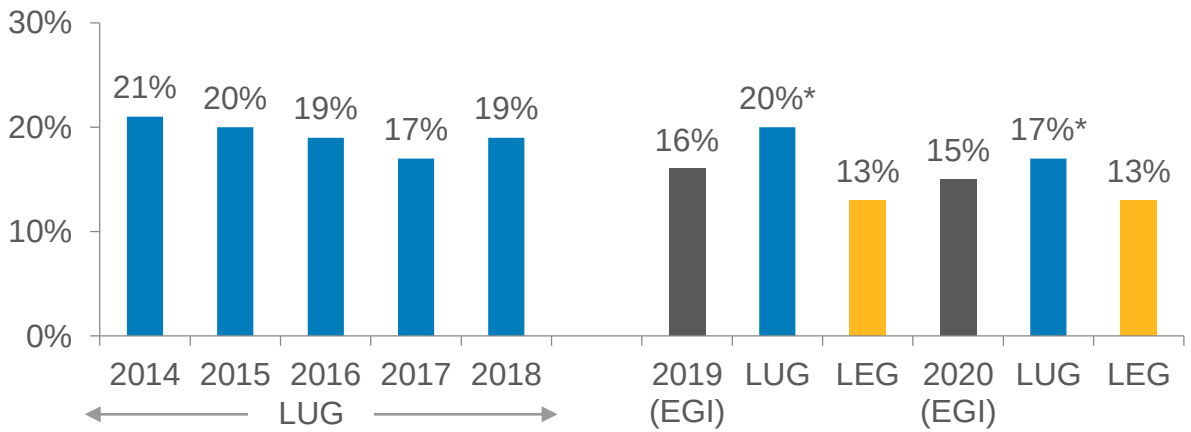
Have a Dryer

(Base: all customers, n=2,400)



Natural Gas Penetration: Clothes Dryers

(Base: all customers)



Q:Do you have a clothes dryer? Q: And is it a natural gas or an electric dryer?

* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

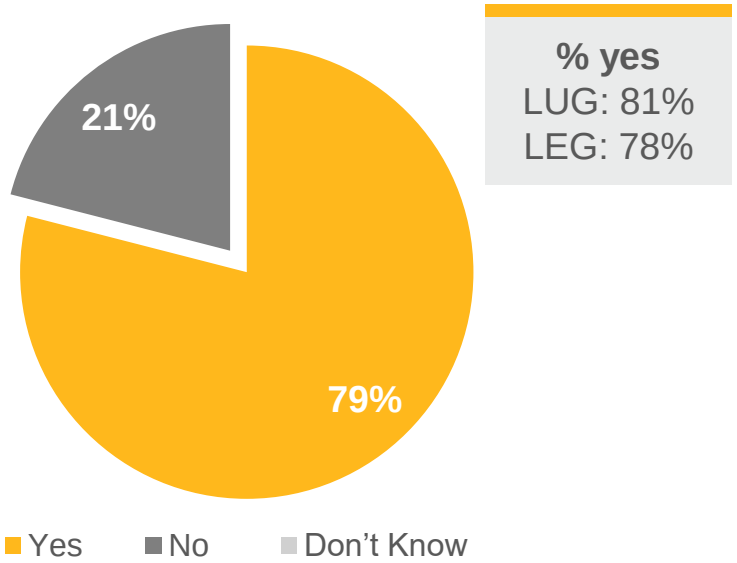
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 21 of 37

Barbecues: NG Adoption & Equipment

- Most single-family homes have an outdoor barbecue (79%) – among them propane (61%) remains the most common fuel type, followed by natural gas (34%, up from 30% in 2019) and charcoal briquettes (5%).
- Households with higher incomes ($140K+) are more likely to have a barbecue and to use natural gas to fuel it (91% ownership, among them 46% using natural gas), compared to lower income households. Just over 2-in-3 of those earning under $40K have a barbecue of which only 27% use natural gas.

Have a Barbecue

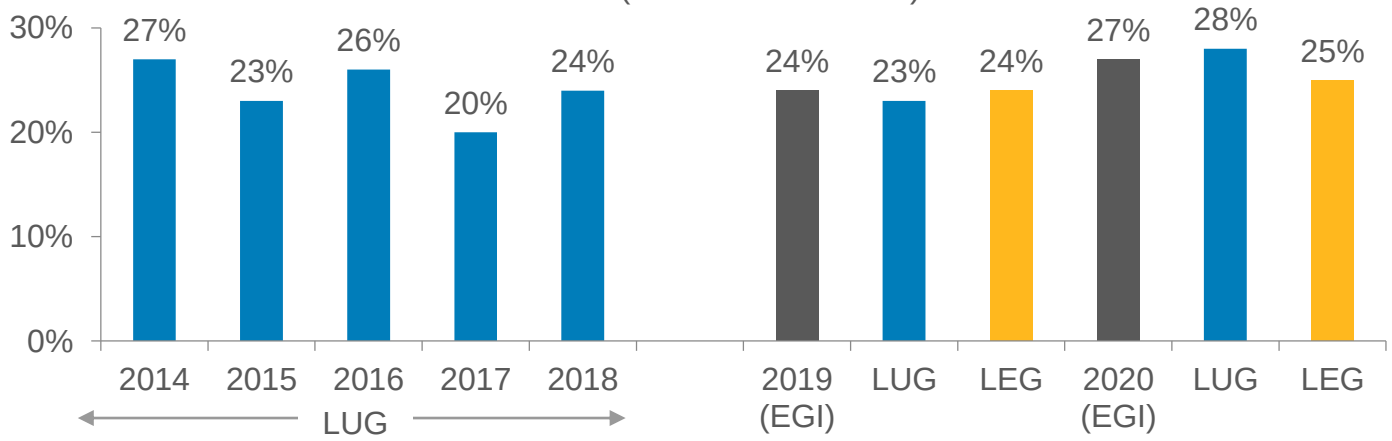
(Base: all customers, n=2,400)



% yes
LUG: 81%
LEG: 78%

Natural Gas Penetration: Barbecues

(Base: all customers)



Q: Do you have an outdoor barbecue at your home? Please do not include any barbecues that are at the cottage, or ones that are used only for camping. Q: And is this barbecue fueled by ...?

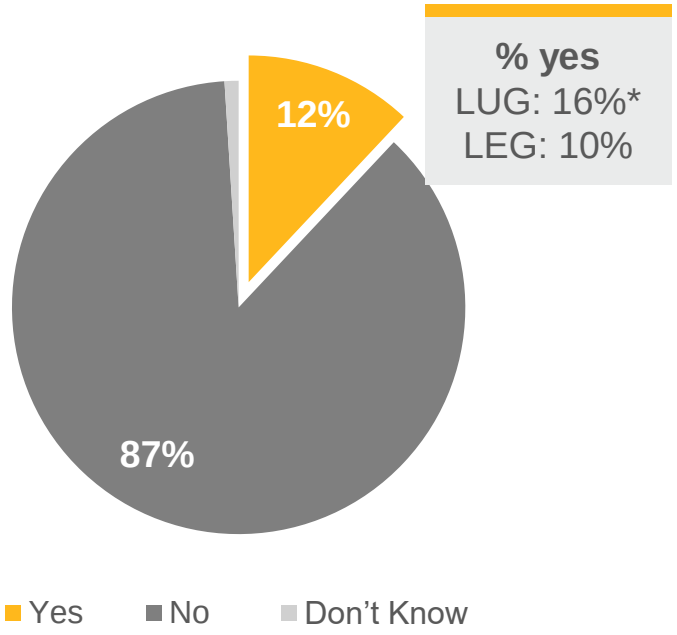
Residential: Single Family Natural Gas End Use Study

Backup Power

- More homes in Northern Ontario have backup power (24%) compared to all other regions, especially Toronto (8%).
- Among sources of backup power, most customers use a portable generator fueled by gasoline or diesel, though the proportion of battery only systems for the house is slowly growing (up from 3% in 2019).

Have a Source of Backup Power

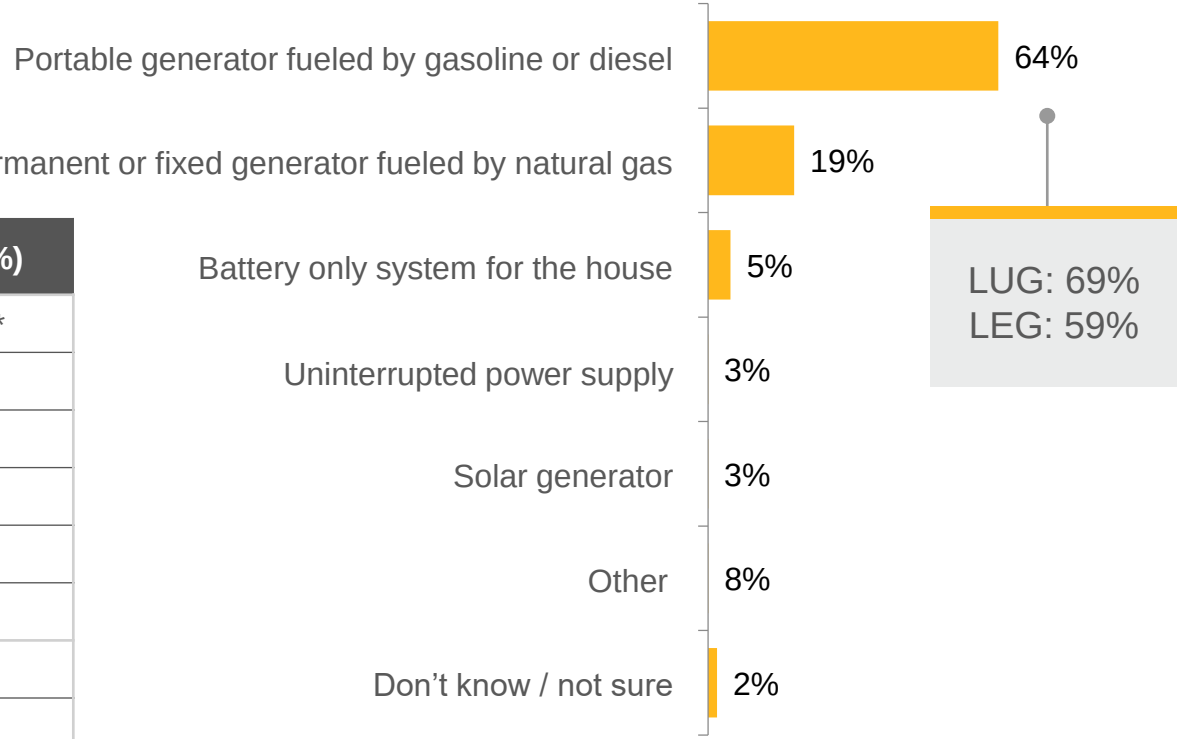
(Base: all customers, n=2,400)



Region	Yes (%)
Northern	24%*
LUG Eastern	14%
LEG Eastern	14%
GTA West & Niagara	9%
Toronto	8%
GTA East	10%
Southeast	14%
Southwest	15%

Type of Backup Power

(Base: customers who have a source of backup power, n=295)



Q: Do you currently have a source of backup power at your home? Q: What type of backup power do you have at your home?

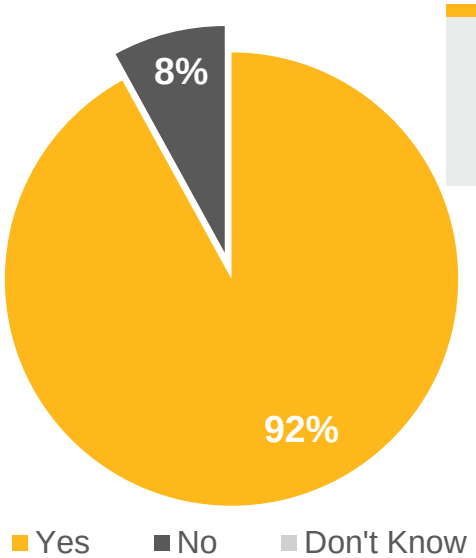
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Insulation: Basement

- 92% of single-family homes have a basement ranging from a low of 83% in the Southwest to a high of 95% in LEG's Eastern region. Across the franchise, older homes are more likely to have poorly insulated or uninsulated basements.
- Household income also appears to be a factor – among low-income customers 15% have poorly or uninsulated basements. This represents customers who may be eligible for the Home Winterproofing Program.

Have a Basement

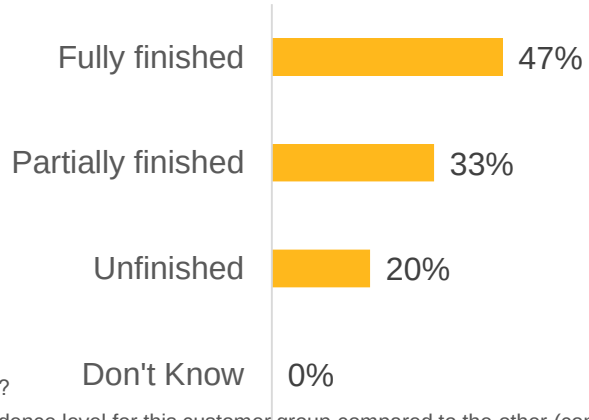
(Base: all customers, n=2,400)



% yes
LUG: 89%
LEG: 94%*

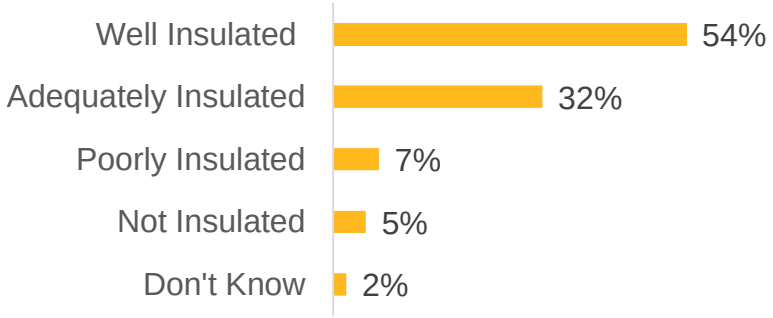
Level of Finish

(Base: customers who have a basement, n=2,212)



Level of Insulation

(Base: customers who have a basement, n=2,212)



Age of Home	Well (%)	Not (%)
Before 1950	35%	16%*
1950-1969	47%	4%
1970-1989	55%	2%
1990-1999	66%*	2%
2000-2020	66%*	2%

Household Income	Well (%)	Not (%)
Under $40K	43%	9%*
$40K-$80K	51%	7%
$80K-$100K	52%	7%
$100K-$140K	53%	4%
$140K+	61%*	1%

Q: Do you have a basement?; Q: Is your basement…?

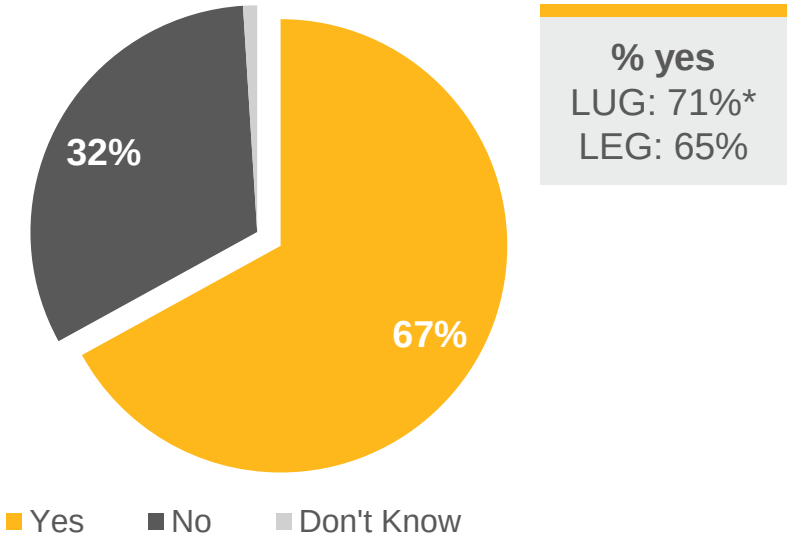
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Insulation: Attic

- Just over 2-in-3 single family homes have an attic ranging from a low of 52% in the Toronto region to a high of 75% in the Northern region. Across the franchise, older homes are more likely to have poorly insulated or uninsulated attics.
- Household income also appears to be a factor – among low-income customers more attics are poorly (5%) or not at all (1%) insulated, and a significant proportion don't know their insulation levels (as high as 10%, higher for attics than for basements), which represents customers who may be eligible for the Home Winterproofing Program.

Have an Attic

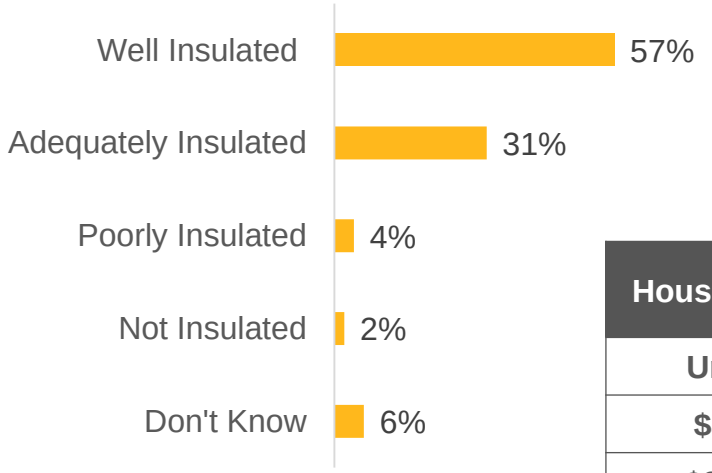
(Base: all customers, n=2,400)



% yes
LUG: 71%*
LEG: 65%

Level of Insulation

(Base: customers who have an attic, n=1,616)



Age of Home	Well (%)	Poorly (%)	Not (%)
Before 1950	55%	12%*	4%
1950-1969	56%	5%	1%
1970-1989	58%	2%	0%
1990-1999	56%	1%	2%
2000-2020	61%	2%	2%

Household Income	Well (%)	Not (%)	Don't Know (%)
Under $40K	55%	1%	10%
$40K-$80K	56%	1%	5%
$80K-$100K	52%	2%	4%
$100K-$140K	59%	1%	8%
$140K+	62%	2%	2%

Q: Do you have an attic? Q: Is your attic …?

* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

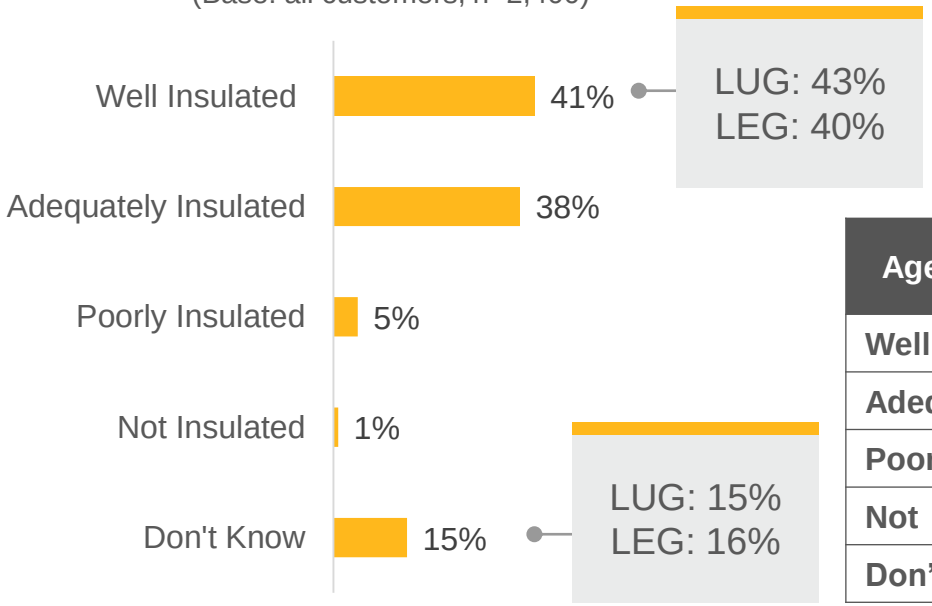
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 25 of 37

Insulation: Home and Exterior Wall

- Customers in LUG are significantly more likely to describe their home as being “well” insulated (43% vs. 40% LEG). Toronto customers are twice as likely as all others to say their home is ‘poorly’ insulated (13% vs. 5% total).
- Perceptions of insulation vary by the age of the home, where newer homes are more likely to be well-insulated compared to homes built before 1950, which sees 17% of customers indicating that their home is poorly insulated.
- Note that 15% of customers were unable to categorize the insulation level of their home.

Level of Home Insulation

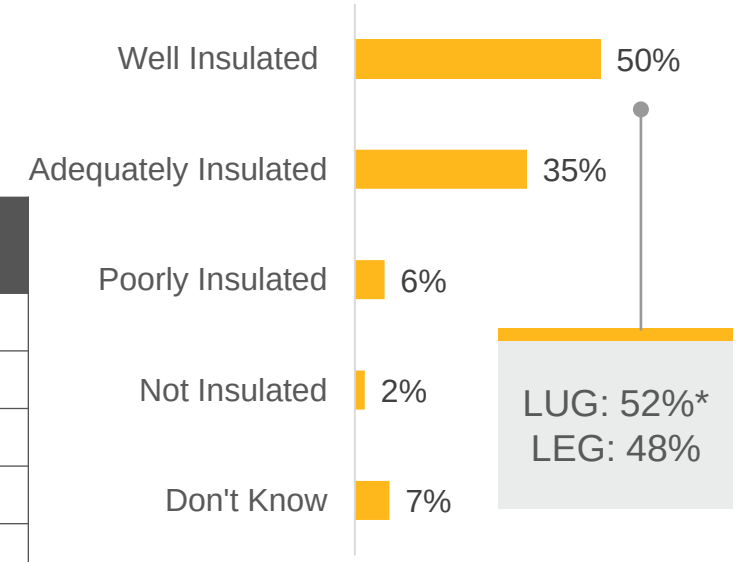
(Base: all customers, n=2,400)



Age of Home	Before 1950	1950-1969	1970-1989	1990-1999	2000-2020
Well	25%	35%	39%	49%*	61%*
Adequate	44%*	41%	45%*	34%	24%
Poor	17%*	8%*	3%	2%	0%
Not	2%*	1%	0%	0%	0%
Don’t Know	12%	15%	13%	15%	15%

Level of Exterior Wall Insulation

(Base: all customers, n=2,400)



Q: How about your exterior, outside walls, are they…?; Q: Which best describes the insulation level of your home?

* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

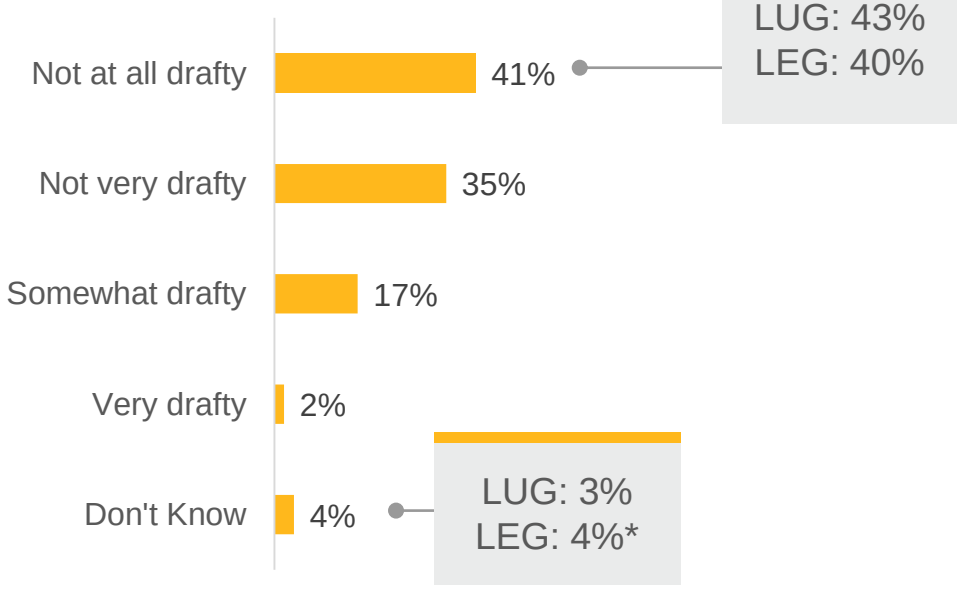
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 26 of 37

Insulation: Level of Draftiness

- A new question about levels of draftiness was asked among customers in 2020, and very similar results are observed compared to customer perceptions of their home insulation. One key difference is that more customers were able to indicate the level of draftiness (don't know is 4%) compared to the level of insulation (don't know is 15%) in their home.
- Window frames and door frames are most commonly mentioned as areas of draftiness, with door frames especially being mentioned in the Northern region (56%) and upper floors / attic by customers in the LEG Eastern region (15%).

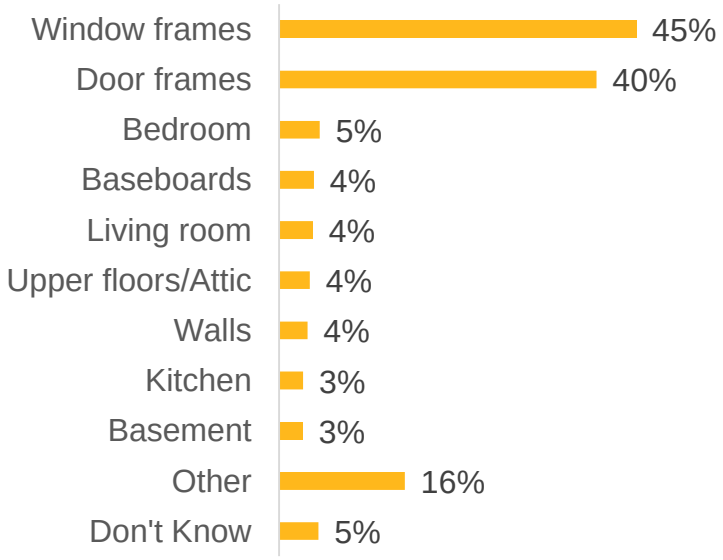
Level of Draftiness

(Base: all customers, n=2,400)



Areas of Draftiness

(Base: customers whose home is somewhat, or very drafty, n=475)



Q: How would you describe the level of draftiness in your home? Q: Where would you say the main areas of draftiness are in your home? (Total mentions)

* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

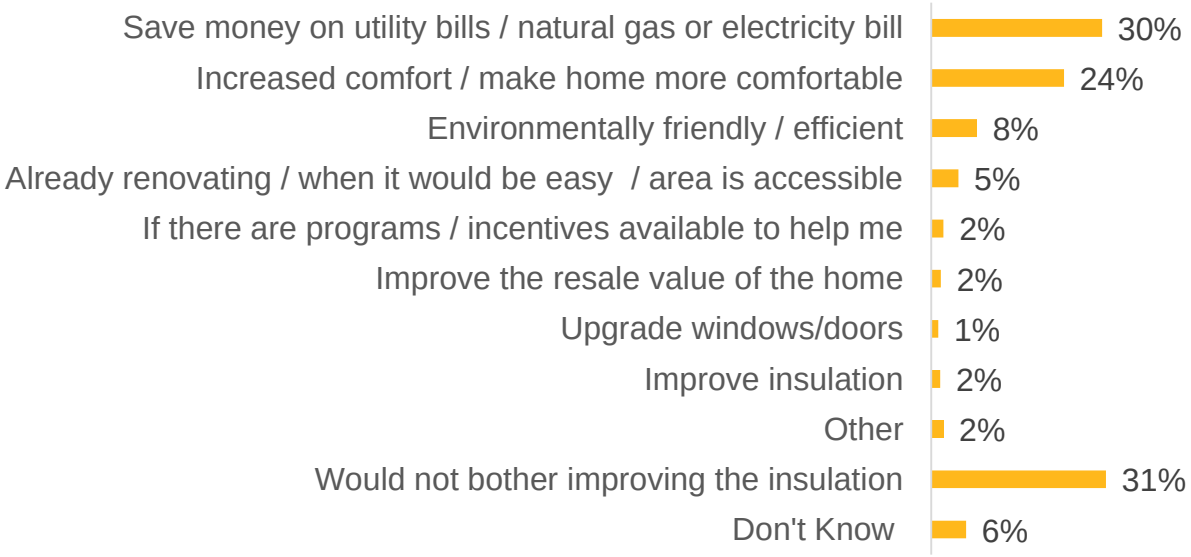
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 27 of 37

Insulation: Motivations for Improving Insulation

- "Customers who indicated their home is not already “well” insulated were asked what would motivate them to improve their insulation. While almost a third indicated that they would not bother (nothing would motivate them), among the remainder, saving money on their utility bills was a key motivator, followed by increasing the comfort of their home.
- Increased comfort was mentioned significantly more often among women (26%), while saving money was mentioned more often among men (33%). Additionally, increased comfort was also mentioned more often among younger customers (age 18-34).

Motivation for Improving Insulation

(Base: customers who indicate that their home is not “well” insulated, n=1,372)



Q: What are the main reasons that you would improve the insulation in your home?

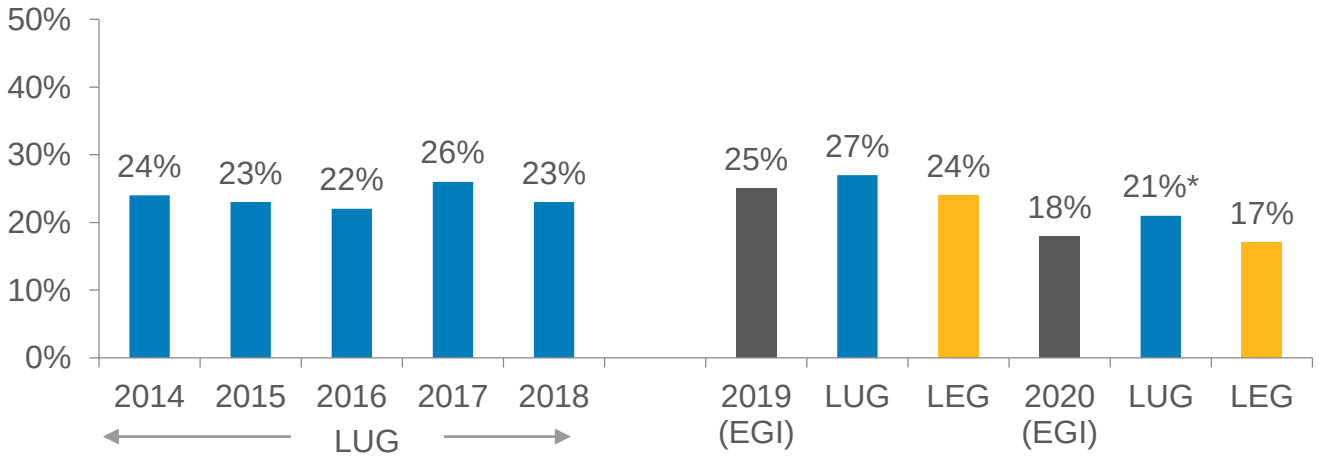
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 28 of 37

Energy Efficiency: Future Intentions

- 18% of customers intend to make their home more energy efficient in the next 2 years, which is the lowest observed result in some time.
- This intention is significantly higher among customers in the Northern region (28%, though down from 38% in 2019) and among customers with homes built before 1950 (22%).
- Younger customers, and larger households (3+) with children (26%) are more likely to have plans to make their home more energy efficient.

Plans to make home more energy efficient in next 2 years (% yes)

(Base: all customers, n=2,400)



	Age Group	Plans (% yes)
	**18 – 34**	32%*
	**35 – 54**	24%*
	**55 – 64**	17%
	**65+**	10%

Region	Yes (%)
Northern	28%*
LUG Eastern	19%
LEG Eastern	17%
GTA West & Niagara	17%
Toronto	17%
GTA East	15%
Southeast	19%
Southwest	19%

Age of Home	Yes (%)
Before 1950	22%
1950-1969	20%
1970-1989	19%
1990-1999	19%
2000-2020	15%

Q: Do you have any plans to make your home more energy efficient within the next two years?

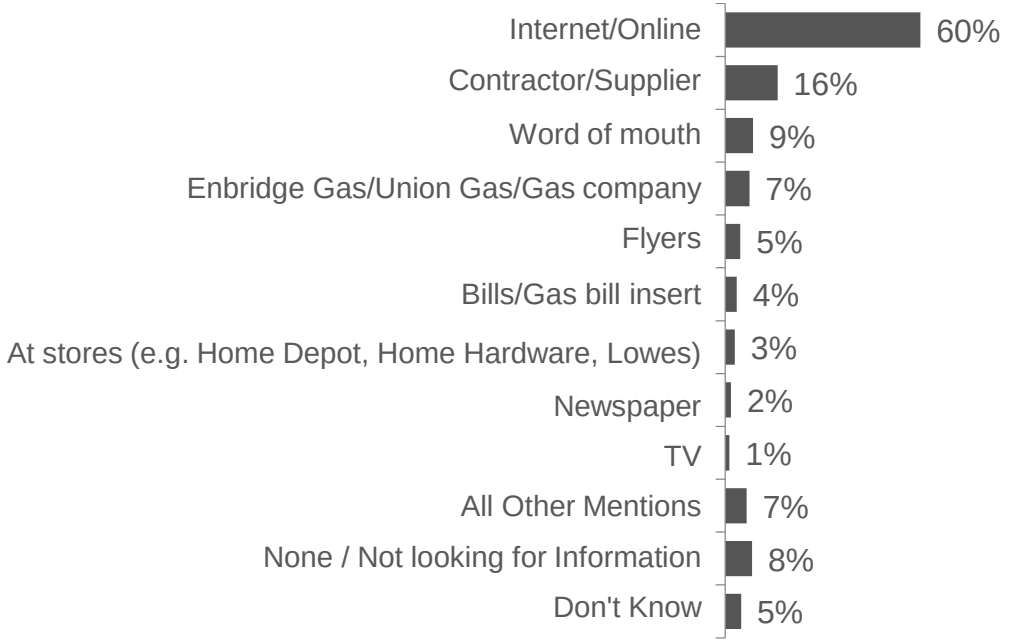
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Energy Efficiency: Sources of Information

- Most customers planning to make their home more energy efficient go online to look for information – senior-led households and lower income households do so at lower rates.
- Contractor/Supplier is mentioned more often this year (compared to 6% in 2019), while all other areas are mentioned less frequently (Internet/Online is down from 65% and Union Gas / Enbridge Gas / gas company is down from 10%).

Top Sources of Information (Unaided)

(Base: all customers who plan to make their home more energy efficient, n=438)



	Age Group	Internet / Online	From LEG/LUG
	**18 – 34**	66%	15%*
	**35 – 54**	64%	7%
	**55 – 64**	62%	6%
	**65+**	45%	6%

Q: Where do you look for energy efficiency information? IF NECESSARY: What sources do you consider?

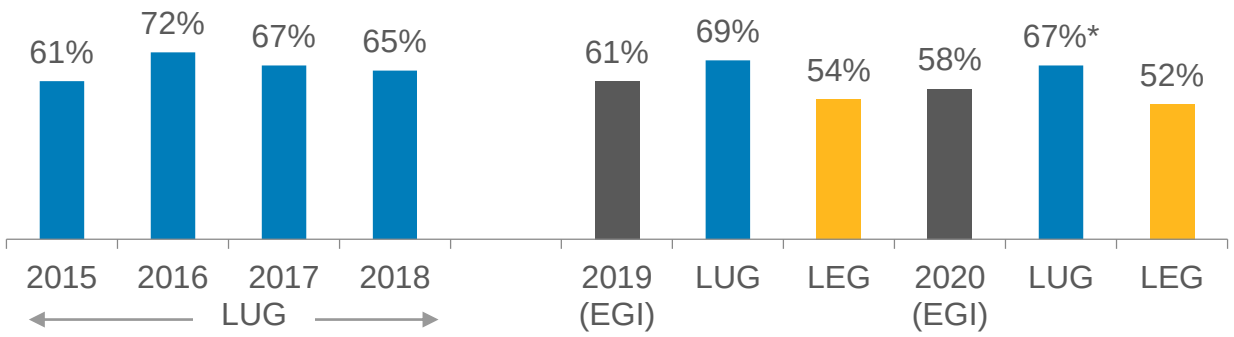
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Energy Efficiency: Awareness of Any Programs

- Awareness that Enbridge Gas offers energy conservation and energy efficiency improvement programs and incentives is significantly higher among LUG customers, and ranges from highest in the Southwest (73%) to lowest in several LEG regions (52%).
- Awareness is also stronger among customers aged 55-64, though they're not as likely to have plans to make their homes more energy efficient compared to their younger counterparts. Awareness is also higher among those whose homes are well insulated (63%) compared to those whose homes are adequately or poorly insulated, providing an opportunity for further marketing.

Aware that LUG/LEG offers Energy Conservation & Efficiency Programs

(Base: all customers, n=2,400)



	Age Group	Aware (% yes)
	**18 – 34**	55%
	**35 – 54**	56%
	**55 – 64**	63%*
	**65+**	58%

Region	Yes (%)
Northern	62%
LUG Eastern	55%
LEG Eastern	52%
GTA West & Niagara	52%
Toronto	52%
GTA East	53%
Southeast	67%*
Southwest	73%*

Q: Are you aware that Union Gas / Enbridge Gas offers energy conservation & energy efficiency improvement programs & incentives to help residential customers like you to save money on their energy bills?

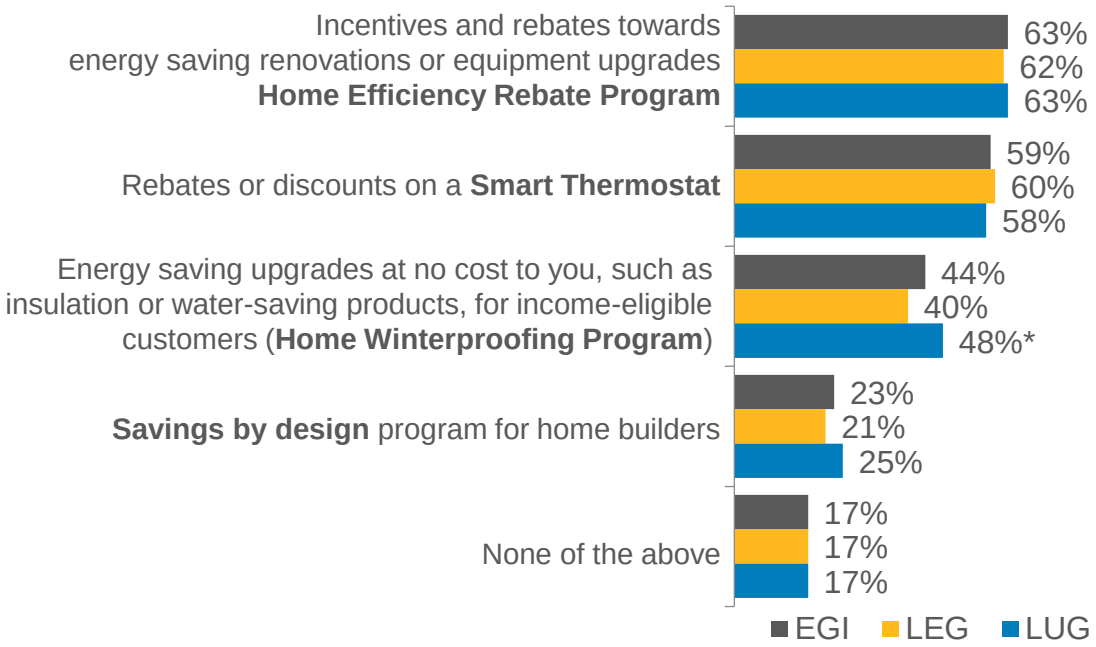
* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

Energy Efficiency: Awareness of Programs

- Among those who are aware that Enbridge Gas offers programs, almost 2-in-3 are aware of the HER program, while just under 1-in-2 are aware of the HWP (more LUG customers are aware of this compared to LEG customers). Awareness of rebates or discounts on a Smart Thermostat follows just behind HER and is similar among LUG and LEG customers.

Offerings Aware of … *(aided awareness)*

(Base: all customers aware that EGI offers programs)



(Base: all customers)

EGI: 36%
LEG: 32%
LUG: 42%

EGI: 34%
LEG: 31%
LUG: 39%

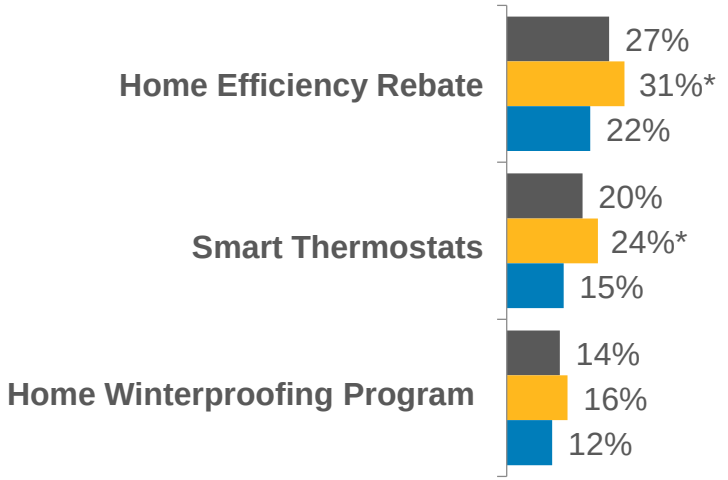
EGI: 25%
LEG: 21%
LUG: 32%

EGI: 13%
LEG: 11%
LUG: 17%

EGI: 10%
LEG: 9%
LUG: 12%

Previously Participated (self-reported)

(Base: all customers aware of the specified program)



(Base: all customers)

EGI: 10%
LEG: 10%
LUG: 9%

EGI: 7%
LEG: 8%
LUG: 6%

EGI: 4%
LEG: 3%
LUG: 4%

HAP (Home Assistance Program offered by the IESO)

EGI: 6%
LEG: 6%
LUG: 5%

Q: Which of the following company energy conservation offerings are you aware of?; Q: Have you ever participated in the ...

* Indicates result is significantly higher at a 95% confidence level for this customer group compared to the other (comparing LUG and LEG customers) or against the total.

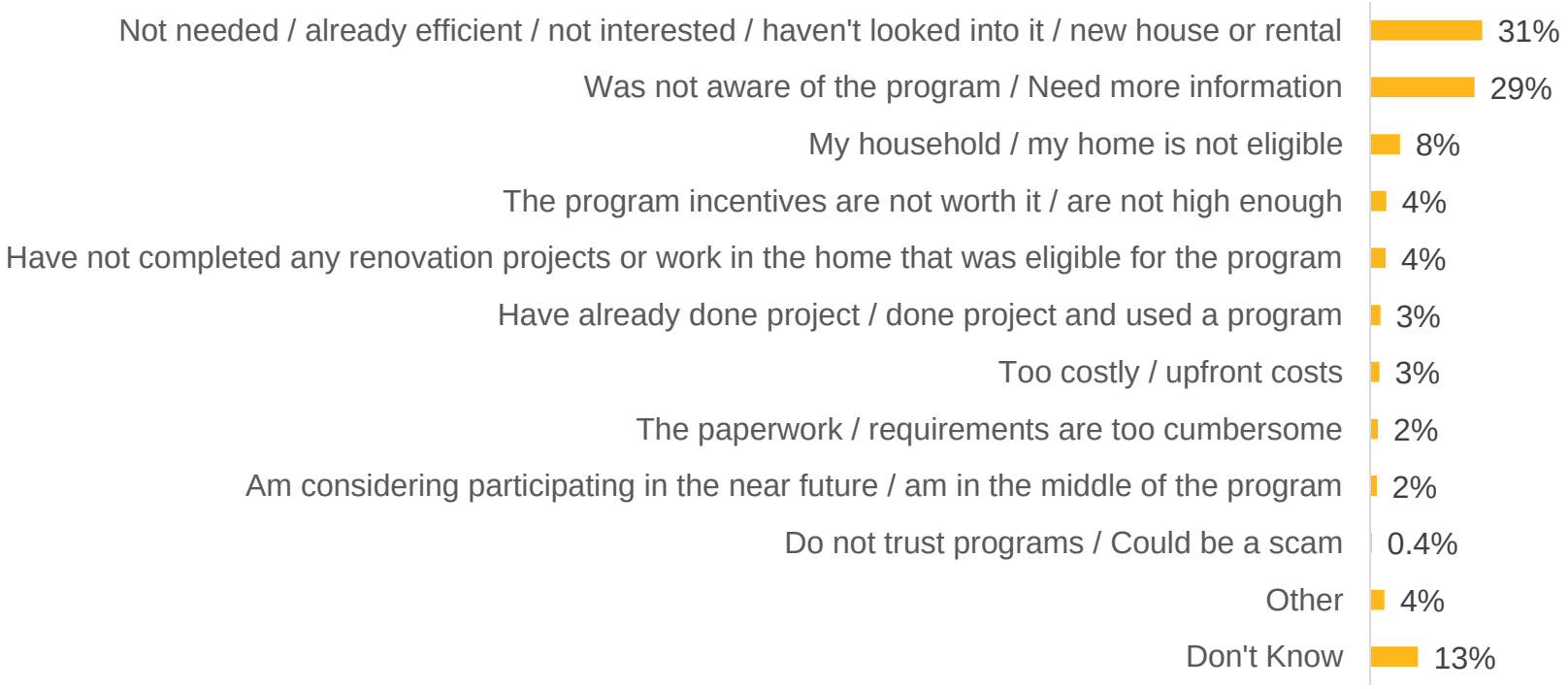
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 32 of 37

Energy Efficiency: Reasons for not Participating

- Customers who were aware of Enbridge Gas' offerings but did not participate in any indicated that they did not need to do any work in the home, or were not interested. Others indicated that they were not fully aware of the program(s) or needed more information.

Reasons for Not Participating in Any Enbridge Gas Program

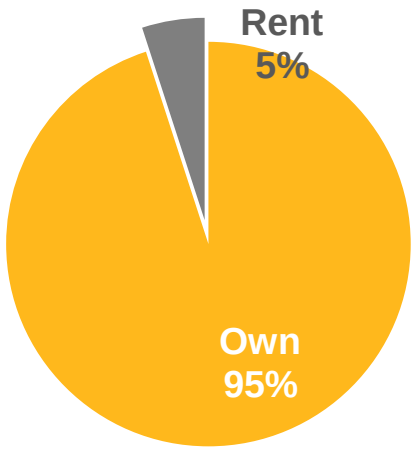
(Base: customers who are aware of any program but have not participated, n=1,710)



Q: What would you say are the main reasons that you have not participated in any of Enbridge Gas' energy conservation programs? (Total mentions)

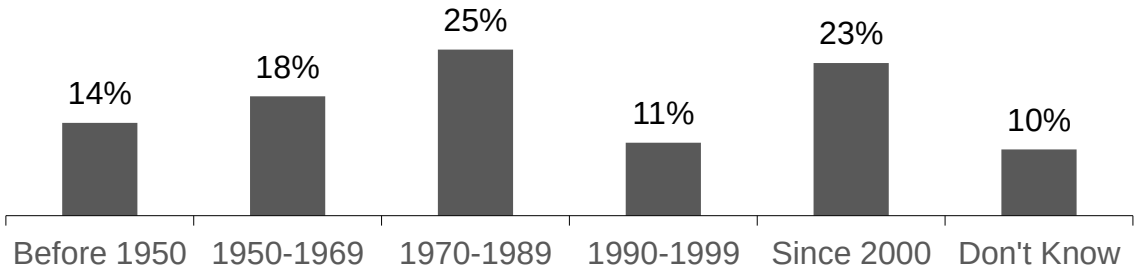
Demographics: House Characteristics (EGI)

Home Ownership

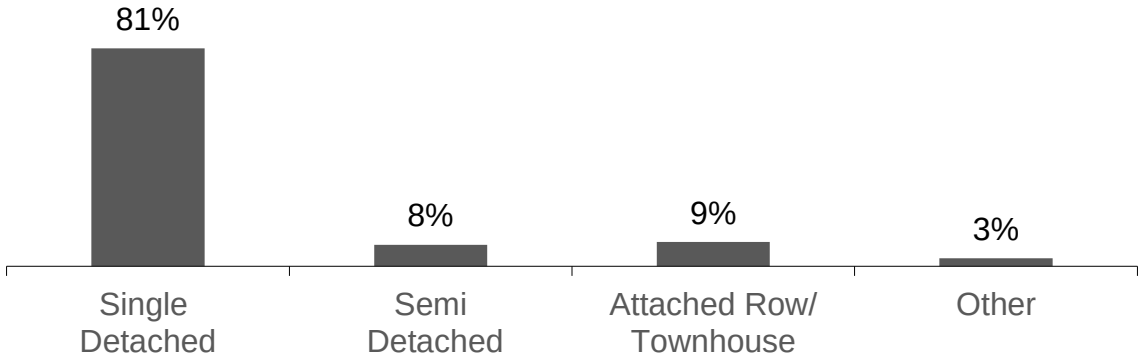


Age of Home

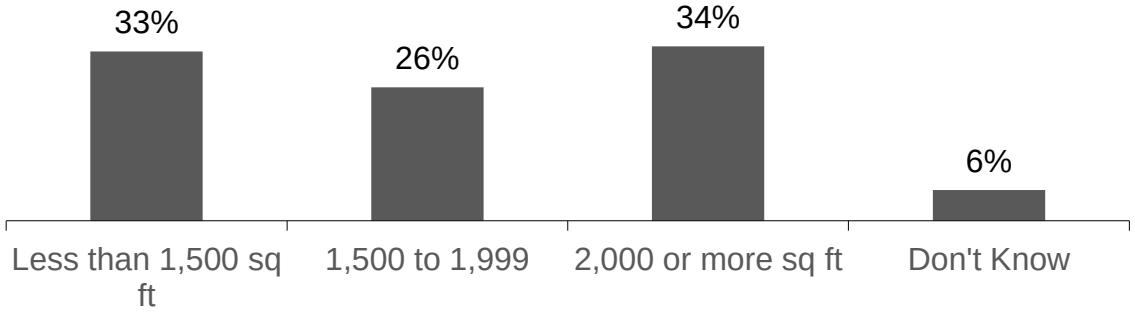
Average: 1974



Type of Home



Size of Home

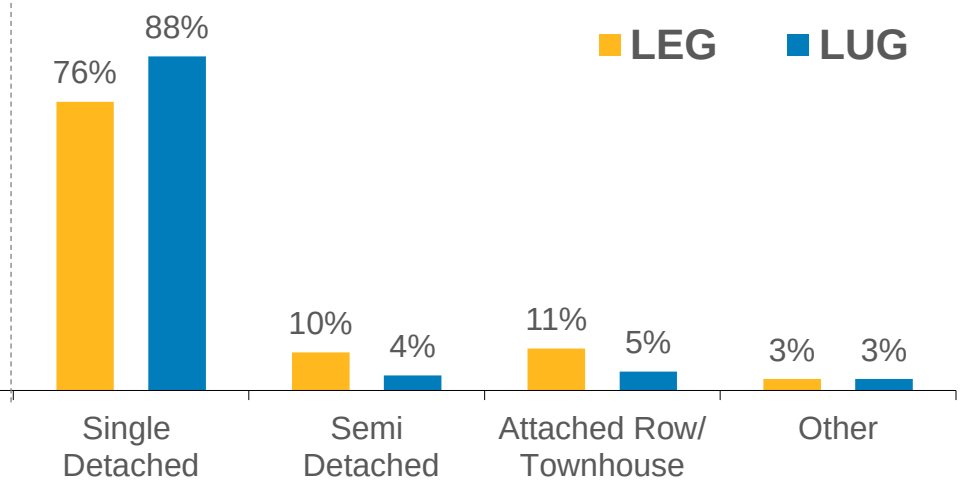


Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 34 of 37

Demographics: House Characteristics (Legacy)

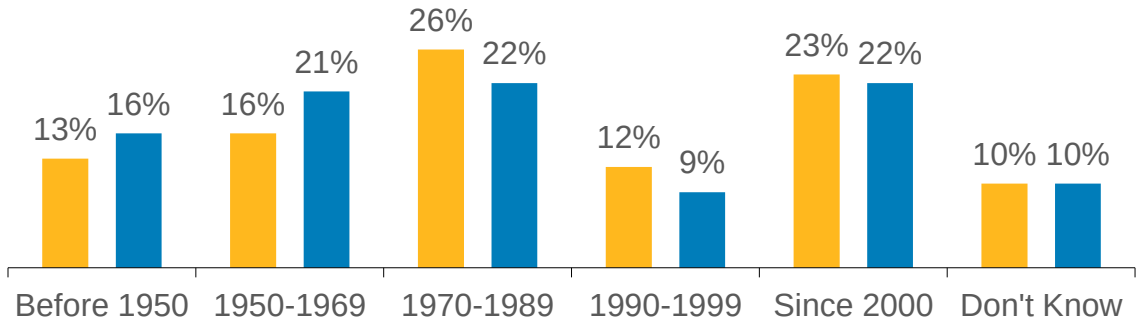
Home Ownership

Type of Home

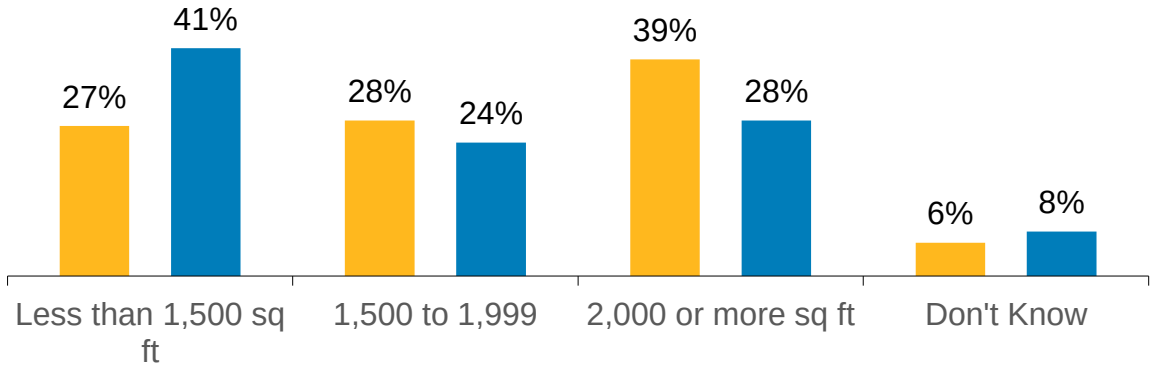


Age of Home

Average
LEG: 1977
LUG: 1971



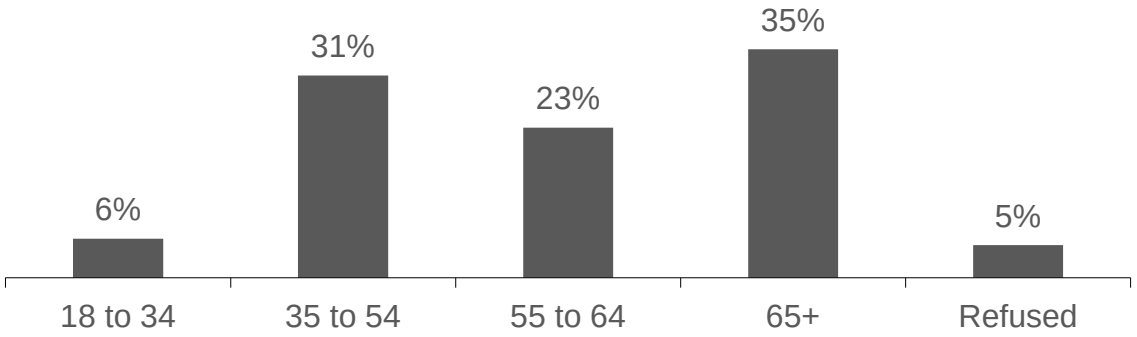
Size of Home



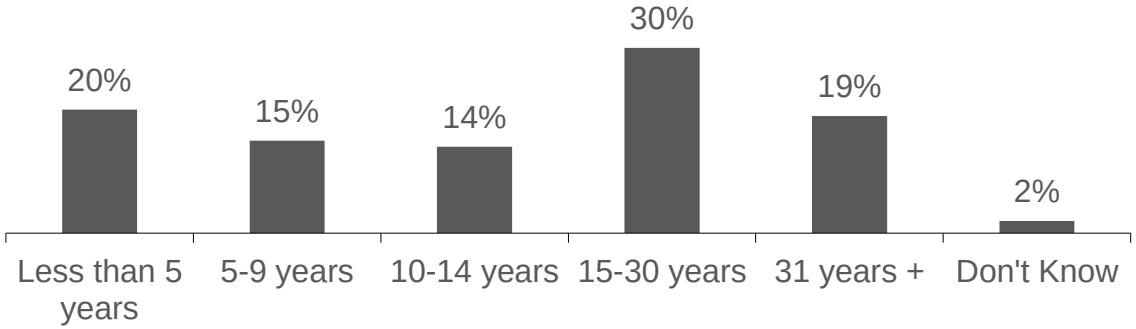
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 35 of 37

Demographics: Customer Characteristics (EGI)

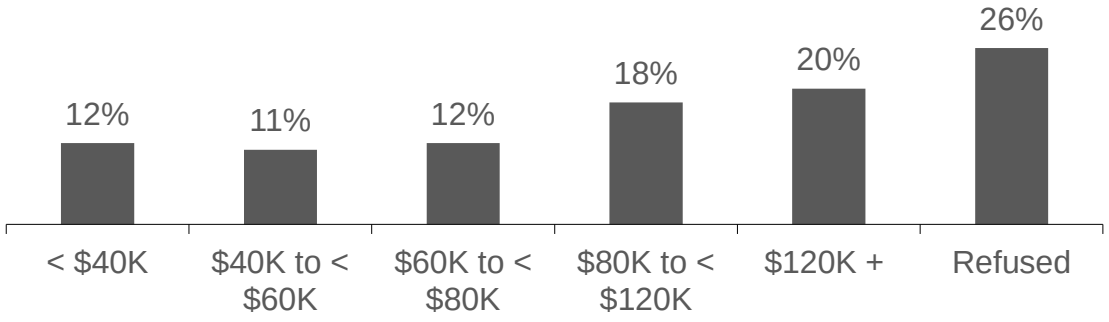
Age



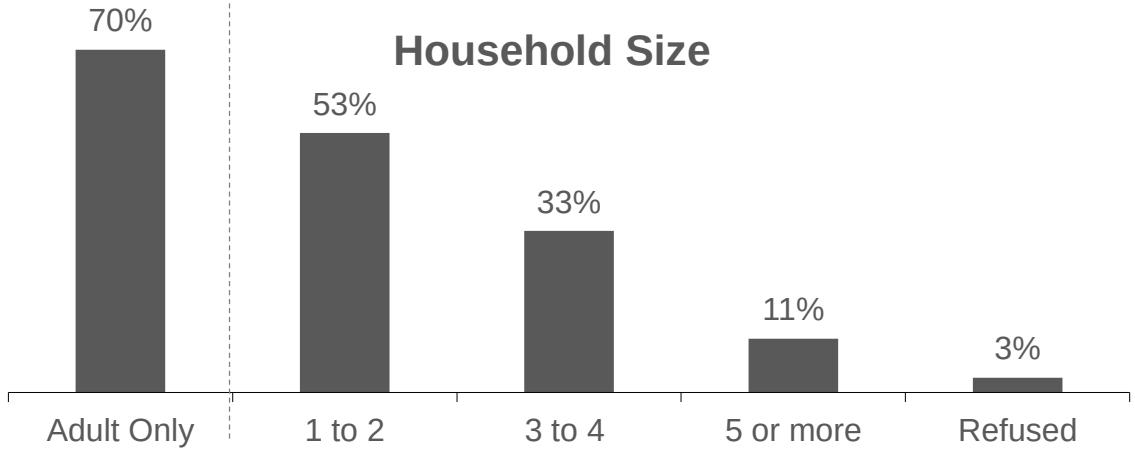
Length of Residence



Household Income



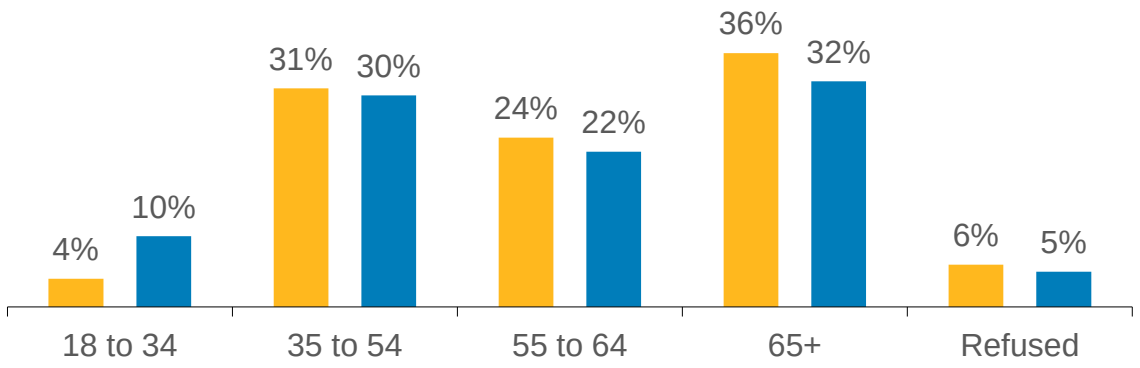
Household Size



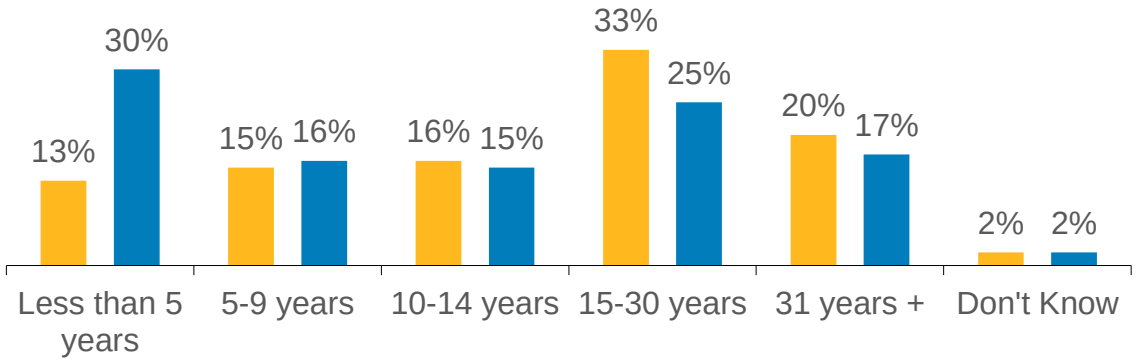
Filed: 2021-11-15, EB-2021-0002, Exhibit I.10.EGI.ED.22, Attachment 1, Page 36 of 37

Demographics: Customer Characteristics (Legacy)

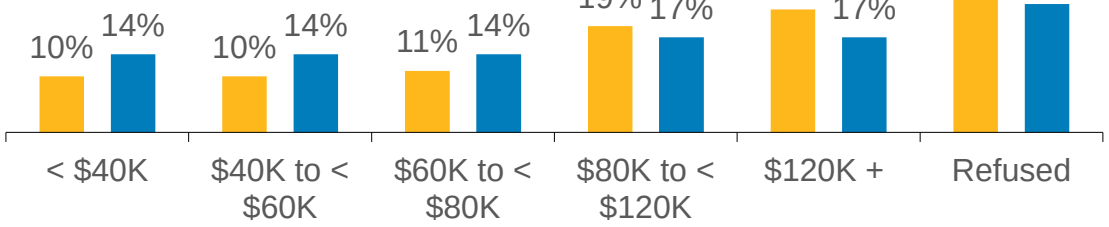
Age



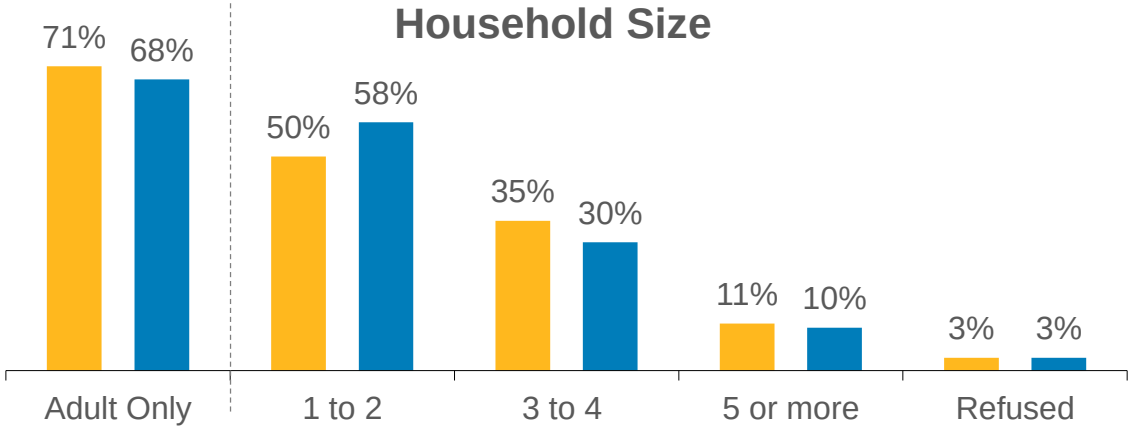
Length of Residence



Household Income



Household Size



Enbridge Gas' Friendly

Customer & Market Insights Team

Follow us on Yammer
"Market Research & Analysis"

Questions?

Please contact:

Gesiena Antuma
Customer & Market Insights
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296
gesiena.antuma@enbridge.com

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 2, Page 12

Preamble:

Enbridge's evidence includes this table:

Water Heater	Replace existing natural gas water heater with 0.80 EF or higher tanked ENERGY STAR® qualified natural gas water heater. Or Replace existing natural gas water heater with 0.87 UEF or higher tankless ENERGY STAR qualified natural gas water heater.	$400

Question(s):

(a) Please calculate the TRC ratio and net benefits for this measure. Please provide all assumptions and calculations.

(b) What is the average lifetime of a natural gas water heater (tank and tankless) for the purposes of estimating measure cost-effectiveness?

(c) For a typical home, what is the annual m^3 consumption for a gas water heater that meets minimum standards versus one that meets the above criteria (please provide the answer for tank and tankless)?

(d) Please provide the data that Enbridge has on the efficiency level of the gas water heaters of its customers. For example, please provide (a) an approximate average efficiency of customer gas water heaters, (b) the number of customers with gas water heaters, (c) the number of customers with gas water heaters within 5% efficiency ranges (e.g. 80-85, 85-90, 90-95 etc). Please provide a breakdown by customer type as possible (single family, etc.).

Response

a) Please see response to Exhibit I.10.EGI.ED.22b.

b) Please see response to Exhibit I.10.EGI.ED.22a.

c) Please see response to Exhibit I.10.EGI.ED.22f.

d) Please see response to Exhibit I.10.EGI.ED.22o.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2

Preamble:

This question is relevant to a number of other issues aside from the programming for new construction.

Question(s):

(a) Please complete this table as much as is possible. Please make and state assumptions and caveats as necessary. Best estimates are sufficient.

Enbridge Customers – Characteristics by Sector			
	2015	…	2030
Total Enbridge Customers			
Residential			
Commercial			
Industrial			
Average Gas Consumption (m3/yr/customer)			
Residential			
Commercial			
Industrial			
Total Enbridge Customers with Air Conditioning			
Residential			
Commercial			
Industrial			
Total Enbridge Customers with Air Conditioning (central, ducted)			
Residential			
Commercial			
Industrial			

Total Enbridge Customers with Gas Water Heater			
Residential			
Commercial			
Industrial			
Total Enbridge Annual Water Heating Load			
Residential			
Commercial			
Industrial			
Total Enbridge Customers with Other Gas Equipment (e.g. stove)			
Residential			
Commercial			
Industrial			

Response

a) Attachment 1 includes Enbridge Gas's actual and forecast customers and volumes by service type (General Service and Contract market) and sector (Residential, Commercial and Industrial). The Company doesn't have the same level of detail provided for the other customer types requested (with AC, other gas equipment etc.).

Table: Enbridge Gas Customers and Consumption by Service type and Sector

	Actual 2015	Actual 2016	Actual 2017	Actual 2018	Actual 2019	Actual 2020	Forecast 2021	Forecast 2022	Forecast 2023	Forecast 2024	Forecast 2025	Forecast 2026	Forecast 2027	Forecast 2028	Forecast 2029	Forecast 2030
General Service																
Residential																
Number of Customers	3,237,152	3,285,272	3,334,545	3,381,450	3,424,068	3,463,393	3,503,999	3,542,988	3,581,336	3,619,638	3,656,897	3,694,224	3,730,290	3,764,642	3,797,454	3,828,911
Annual Volumes (106m3)*	7,713	7,676	7,965	8,070	8,224	8,286	8,161	8,252	8,288	8,349	8,377	8,422	8,465	8,521	8,541	8,575
Average use per customer (m3)**	2,383	2,336	2,389	2,387	2,402	2,392	2,329	2,329	2,314	2,307	2,291	2,280	2,269	2,263	2,249	2,239
Small Commercial																
Number of Customers	272,217	274,089	276,298	278,094	280,104	281,893	283,071	285,070	286,603	288,046	289,422	290,719	291,893	292,940	293,877	294,715
Annual Volumes (106m3)*	6,161	6,054	6,313	6,410	6,515	6,440	6,217	6,326	6,384	6,423	6,444	6,479	6,514	6,557	6,581	6,614
Average use per customer (m3)**	22,634	22,088	22,848	23,049	23,258	22,845	21,961	22,192	22,273	22,298	22,264	22,287	22,317	22,384	22,392	22,443
Small Industrial																
Number of Customers	11,322	11,221	11,163	11,095	10,996	10,985	10,982	10,976	10,974	10,973	10,971	10,970	10,969	10,967	10,966	10,965
Annual Volumes (106m3)*	1,163	1,139	1,160	1,159	1,155	1,047	1,053	1,070	1,056	1,051	1,045	1,040	1,035	1,031	1,024	1,019
Average use per customer (m3)**	102,748	101,529	103,933	104,480	105,070	95,297	95,851	97,467	96,212	95,768	95,209	94,777	94,325	94,049	93,344	92,905
Total General Service																
Number of Customers	3,520,692	3,570,581	3,622,006	3,670,639	3,715,168	3,756,270	3,798,052	3,839,034	3,878,914	3,918,658	3,957,291	3,995,913	4,033,151	4,068,550	4,102,297	4,134,591
Annual Volumes (106m3)*	15,037	14,869	15,438	15,639	15,895	15,772	15,430	15,648	15,727	15,823	15,866	15,941	16,014	16,109	16,145	16,207.494
Contract																
Number of Customers	852	881	885	891	905	969	981	988	989	989	989	989	989	989	989	989
Annual Volumes (106m3)*	10,967	10,719	9,513	10,320	10,404	10,394	10,430	10,792	10,997	11,024	11,038	11,129	11,156	11,247	11,261	11,365
Total EGI																
Number of Customers	3,521,544	3,571,463	3,622,891	3,671,530	3,716,073	3,757,239	3,799,034	3,840,021	3,879,902	3,919,646	3,958,279	3,996,902	4,034,139	4,069,538	4,103,286	4,135,579
Annual Volumes (106m3)*	26,005	25,588	24,951	25,959	26,299	26,166	25,860	26,439	26,724	26,847	26,904	27,070	27,170	27,356	27,406	27,572

*Annual Volumes are normalized to 2022 Budget Degree Days

**Normalized average use per customer numbers in table are determined by dividing the total volumes to the total number of customers for each year and sector. All figures shown are for illustration purpose only.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2

Question(s):

(a) In the residential savings by design program, would Enbridge help a customer calculate the costs of adopting electric heating (ccASHP, etc.) instead of gas heating?

(b) In the residential savings by design program, are electric cold climate air source heat pumps and heat pump water heaters eligible equipment for incentives for potential gas customers deciding *not* to connect to the gas system?

(c) In EB-2019-0188, Exhibit I.ED.9(d), Enbridge indicated that the annual cost of heating with a heat pump would be lower than the cost of natural gas heating if the surcharge was considered. Please provide the underlying calculations. Please file a live version of the "Residential Natural Gas Conversion Savings Estimate" excel document (I.ED.7 in EB-2019-0188) with the variables that produced the result in I.ED.9(d).

(d) Please comment on the applicability of this to other areas where a surcharge would be charged.

(e) Please update the analysis (i.e. input updated variables into the savings estimate tool) based on the latest carbon pricing information from the federal government (i.e. increases to $170/t CO2e in 2030). Please indicate the difference in cost between heat pumps and gas heating. Please file a live copy of the savings tool with these updated variables inputted into it.

Response

a) Yes, through the IDP process, Enbridge Gas has and will continue to support the exploration of different fuel agnostic heating alternatives for builder consideration.

b) No, as outlined by the OEB in their December 1, 2020 DSM Letter, the "primary objective of ratepayer-funded natural gas DSM is assisting **customers** *[emphasis added]* in making their homes and businesses more efficient in order to help better manage their energy bills."[1] In the case of newly constructed homes, Enbridge Gas interprets this to mean that the eventual residents of these homes will be natural gas customers. As outlined in the plan: "Residential homes built by participating builders are required to use natural gas as a fuel source for space and/or water heating and must be located within the Enbridge Gas franchise area."[2]

c - e)

Enbridge Gas does not believe this is relevant to this proceeding. However a link to an interactive web-based calculator to estimate gas savings for a typical residential customer in either communities that are currently connected to natural gas or community expansion projects that are underway, has been provided in the response to Exhibit I.10.EGI.ED.37d.

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020).
[2] EB-2021-0002, DSM Multi-year Plan and Framework Application (May 3, 2021), Exhibit E, Tab 2, Schedule 2, p. 14.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2

Preamble:

Navigant made the following recommendation at page xxi of the 2019 Achievable Potential Study:

> "The four most important of Navigant's recommendations for improving future studies are provided below. … Ensure the costs of natural gas expansion are properly accounted for within the natural gas avoided costs. It is unclear to what degree the natural gas avoided costs currently account for the costs associated with natural gas infrastructure expansion, specifically the costs of installing pipelines (and associated equipment) to connect new developments to the natural gas distribution network."
> Page 186 of the 2019 Achievable Potential Study states:
>
> "**Ensure the costs of natural gas expansion are properly accounted for within the natural gas avoided costs.** It is unclear to what degree the natural gas avoided costs account for the costs associated with natural gas infrastructure expansion. For example, when considering fuel switching for new construction, it seems likely that the existing avoided costs would understate the benefit of not having to install pipelines and access points to a new housing development."

The OEB's guidance letter includes the following:

> "Enbridge Gas's DSM plan application should be informed by … the 2019 Achievable Potential Study …" (p. 2).
>
> "The OEB completed an updated Achievable Potential Study in October 2019. The study was integrated with the IESO with the objective of identifying and quantifying energy savings (electricity and natural gas), greenhouse gas emissions reductions and associated costs from demand side resources for the period from 2019 to 2038. While not determinative,

the OEB expects that the findings from the study will be used to inform future natural gas DSM plans." (p. 4-5)

Note that this question is also related to other issues, such as the appropriateness of the gas savings levels and budgets proposed by Enbridge.

Question(s):

(a) Please complete the following table. Please include a project based on the year of completion or any other consistent method, explaining which is used. Please make and state any assumptions and caveats with respect to estimates for future expansion costs. This question relates to new residential developments, not the government-funded community expansion program or the costs thereof.

Capital Costs to Connect New Residential Developments				
	2015	2016	…	2030
Number of projects				
Number of residential customers[1]				
Total capital cost				
Portion funded via rates ($)				
Portion funded by the new customers ($)[2]				

(b) Please complete the following table. Please include a project based on the year of completion or any other consistent method, explaining which is used. Please make and state any assumptions and caveats with respect to estimates for future expansion costs. This question relates to new residential developments, not the government-funded community expansion program or the costs thereof.

Capital Costs to Connect New Commercial / Industrial Customers				
	2015	2016	…	2030
Number of projects				
Number of customers[3]				
Total capital cost				
Portion funded via rates ($)				
Portion funded by new customers ($)[4]				

[1] The number of customers to be connected for the projects in that year once the development is completed.
[2] This would include, for example, a CIAC, including both up-front contributions and rate riders.
[3] The number of customers to be connected could potentially be larger than the number of projects in the case, for example, of a business park that will have multiple commercial customers.
[4] This would include, for example, a CIAC, including both up-front contributions and rate riders.

(c) Please describe in detail how contributions in aid of construction (CIAC) typically work for residential developments. For example, approximately what percent of the CIAC is paid up front, if any? For portions of the CIAC paid over time, how are they recouped? What entity negotiates and agrees to the CIAC terms (e.g. the developer?)? Who paid for the majority of the CIAC (e.g., the future homeowners via rate riders?)?

(d) Are all customer connection costs for new residential developments considered to be a CIAC? If not, please explain and compare the magnitude of these other costs to the magnitude of the CIACs.

(e) Please provide the average capital cost for connecting a new residential development expressed as an average per customer to be connected. Please also provide high and low range (e.g. top and bottom quartile for capital cost per customer). Please provide a breakdown for the capital cost funded in general rates versus those costs funded by the new customers (e.g. through the CIAC).

Response

a) The requested tables are presented by rate zone below. Please note the following assumptions:

   i. Years 2015-2020 represent actual costs and customer additions. Years 2021-2024 represent budgeted costs and additions from the EGI Asset Management Plan (AMP) and AMP Addendum
   ii. The capital projects in the Union Gas rate zone are not tracked by type of cost to connect (i.e. by new residential developments and by commercial/industrial customers)
   iii. The costs in the Union Gas rate zone table are illustrative only and are based on allocating total Customer Connection costs as a % of customer additions by category
   iv. For both rate zones, budget costs do not include detailed estimates of CIAC. CIAC is therefore estimated based on a 3-year average
   v. The number of projects is not available in either rate zone due to the complexity of going through each project to identify the category of spend (i.e. by new residential developments and by commercial/industrial customers)

	Capital Costs to Connect New Residential Developments									
Union Gas Rate Zone	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Number of Projects										
Number of residential customers	10,307	11,635	12,328	12,561	9,396	9,753	10,298	10,115	9,897	9,842
Total Capital Cost	30,915,542	32,906,708	30,243,857	32,363,899	33,348,160	34,120,069	34,731,493	39,554,508	35,042,344	35,975,425
Portion funded via rates ($)	33,729,945	35,205,131	32,359,417	37,601,354	35,861,470	36,631,641	37,711,759	42,726,150	38,255,007	39,282,386
Portion funded by the new customers ($)	(2,814,404)	(2,298,424)	(2,115,560)	(5,237,455)	(2,513,309)	(2,511,572)	(2,980,266)	(3,171,642)	(3,212,663)	(3,306,961)

	Capital Costs to Connect New Residential Developments									
EGD Rate Zone	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Number of Projects										
Number of residential customers	22,597	23,289	26,174	23,011	19,295	20,320	20,325	19,704	19,393	18,972
Total Capital Cost	37,247,187	46,482,925	40,265,232	63,016,470	44,433,893	64,813,531	55,645,068	55,222,440	55,108,937	54,494,189
Portion funded via rates ($)	46,815,702	65,834,957	42,898,538	67,535,522	47,319,757	66,947,449	58,888,272	58,530,508	58,483,166	57,935,903
Portion funded by the new customers ($)	(9,568,515)	(19,352,032)	(2,633,306)	(4,519,052)	(2,885,864)	(2,133,918)	(3,243,204)	(3,308,068)	(3,374,229)	(3,441,714)

b) The requested tables are presented by rate zone below. Please note the following assumptions:
   i. Years 2015-2020 represent actual costs and customer additions. Years 2021-2024 represent budgeted costs and additions from the EGI AMP and AMP Addendum
   ii. The capital projects in the Union Gas rate zone are not tracked by type of cost to connect (i.e. by new residential developments and by commercial/industrial customers)
   iii. The costs in the Union Gas rate zone table are illustrative only and are based on allocating total Customer Connection costs as a % of customer additions by category
   iv. For both rate zones, budget costs do not include detailed estimates of CIAC. CIAC is therefore estimated based on a 3-year average
   v. The number of projects is not available in either rate zone due to the complexity of going through each project to identify the category of spend (i.e. by new residential developments and by commercial/industrial customers)

	Capital Costs to Connect New Commercial/Industrial Customers									
Union Gas Rate Zone	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Number of Projects										
Number of customers	1,493	1,550	1,329	1,504	1,313	1,110	1,396	1,120	1,254	1,230
Total Capital Cost	4,478,209	4,383,790	3,260,390	3,875,114	4,660,082	3,883,244	4,708,212	4,379,738	4,440,042	4,496,014
Portion funded via rates ($)	4,885,884	4,689,983	3,488,454	4,502,224	5,011,293	4,169,089	5,112,217	4,730,923	4,847,103	4,909,300
Portion funded by the new customers ($)	(407,675)	(306,193)	(228,065)	(627,110)	(351,211)	(285,845)	(404,006)	(351,185)	(407,061)	(413,286)

	Capital Costs to Connect New Commercial/Industrial Customers									
EGD Rate Zone	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Number of Projects										
Number of customers	2,166	1,632	2,139	1,611	1,682	1,279	1,289	1,292	1,296	1,213
Total Capital Cost	17,364,204	16,268,983	18,364,113	11,152,665	15,590,880	14,957,458	23,686,299	23,406,998	23,416,939	23,108,080
Portion funded via rates ($)	19,637,266	23,175,538	21,943,658	19,699,381	21,541,316	20,746,353	30,583,555	30,442,199	30,592,844	30,427,503
Portion funded by the new customers ($)	(2,273,062)	(6,906,555)	(3,579,545)	(8,546,716)	(5,950,436)	(5,788,895)	(6,897,256)	(7,035,201)	(7,175,905)	(7,319,423)

c) For new residential developments CIAC is calculated based on the feasibility analysis as prescribed in EBO 188 guideline of the OEB. If the feasibility analysis determines that a CIAC is required for a new development, it is collected up front before the facility is built. No portion of the CIAC is paid over time. Builders and/or developers of the new residential development negotiate the CIAC with the Company and make up front payments (if applicable) before construction starts.

d) No. A feasibility analysis is done to determine if a CIAC is required to connect the new development. The feasibility analysis evaluates the forecast revenues of the project versus its costs. If the project revenues are enough to cover the costs, no CIAC is required to be paid by the developer / builder of new developments. However, if the forecast revenues fall short of the project cost, a CIAC will be required to build the facility.

e) Enbridge Gas cannot without an undue amount of effort provide this information as the capital system does not track costs at this level (i.e. by new residential developments and by commercial/industrial customers). To reasonably provide what is being asked, Enbridge Gas would have to go through a data dump of all capital projects and manually identify the residential, commercial/industrial developments. Enbridge Gas also questions the value of such an exercise as the annual average in one year is not a reasonable indication of the cost of adding new developments in future given the variability of geography, proximity to existing infrastructure and the size of developments.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2

Preamble:

Page 186 of the 2019 Achievable Potential Study states:

> "**Ensure the costs of natural gas expansion are properly accounted for within the natural gas avoided costs.** It is unclear to what degree the natural gas avoided costs account for the costs associated with natural gas infrastructure expansion. For example, when considering fuel switching for new construction, it seems likely that the existing avoided costs would understate the benefit of not having to install pipelines and access points to a new housing development."

Question(s):

(a) Is Enbridge open to the concept of it providing geothermal pipe installations for new construction in cases where the customers would otherwise connect to the gas system (either via a subsidiary or as a rate-regulated activity)?

(b) Please confirm that avoiding the design day demand from new customer connections could passively avoid future needs for upstream infrastructure expansions (i.e. avoid infrastructure needs despite not being part of a specific IRPA for a specific area)?

(c) Please assess the TRC cost effectiveness of installing ground source heat pumps and air-source heat pump water heaters (e.g. link) in a new residential development instead of the standard gas equipment used. Please (i) include the impact on gas and electricity consumption and costs, (ii) account for the avoided cost of pipeline connections, (iii) assume a horizontal loop is possible, (iv) account for the differential equipment costs (including no need for a separate AC unit), and (v) assume the heat pumps are energy star rated. Please include all assumptions and calculations.

Response

a) – c)

This question is not in scope for this proceeding, as DSM programs are funded through gas distribution rates and targeted to gas consumers. In the case where a building owner is not connected or does not intend to be connected to the gas system, that building owner is not then a customer of Enbridge Gas and is therefore not eligible for DSM programs.

In the DSM Letter, the OEB stated "…the OEB is of the view that the primary objective of ratepayer-funded natural gas DSM is assisting **customers** *[emphasis added]* in making their homes and businesses more efficient…."[1]

The OEB indicated that ratepayer funds should assist customers (gas ratepayers). This is further reinforced by the DSM Letter referencing and including a link to the letter from the Ministry of Energy in which the ministry emphasized the importance of, "Ensuring that an appropriate level of DSM programming remains available to ***natural gas customers*** *[emphasis added]* without interruption…"[2]

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p.2.
[2] MC-994-2020-1084, Ministry of Energy, Northern Development and Mines, Office of the Associate Minister of Energy Letter to the Ontario Energy Board (November 27, 2020), p. 2.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Question(s):

(a) Is Enbridge open to the concept of it providing geothermal pipe installations for existing customers at the end of their existing furnace's life (either via a subsidiary or as a rate-regulated activity)? Has Enbridge explored this as a potential DSM measure? If not, why not?

(b) Enbridge previously proposed a geothermal program, which it withdrew due to the end of provincial subsidies for geothermal equipment. Does Enbridge agree that, since that time, the cost-effectiveness of geothermal has improved due to (a) increases in the carbon price and (b) the geothermal subsidies recently rolled out by the federal government?

(c) Please confirm that geothermal is an allowable business activity for Enbridge. Please provide a copy of the relevant portions of the relevant documents delineating this.

(d) Please assess the TRC of installing a ground source heat pump in a typical home. Please (i) include the impact on gas and electricity consumption and costs, (ii) assume the heat pump replaces a furnace and air conditioner which are at the end of life, (iii) assume a horizontal loop is possible, and (iv) assume the ground source heat pump is Energy Star rated. Please include all assumptions and calculations.

(e) Please assess the TRC of installing a ground source heat pump and an in-house air-source heat pump water heater (e.g. link) in a typical home. Please (i) include the impact on gas and electricity consumption and costs, (ii) assume the ground source heat pump replaces a furnace and air conditioner which are at the end of life, (iii) assume a horizontal loop is possible, and (iv) the heat pumps are Energy Star rated. Please include all assumptions and calculations.

Response

a) – e)

Enbridge Gas has not presently explored geothermal installations as a potential DSM measure due to high upfront costs for retrofit applications. The Company notes that horizontal loop applications require very large lot sizes and are not generally feasible in urban or suburban areas, reducing any applicable market potential substantially. At this time Enbridge Gas has not proposed any geothermal applications for DSM measures but this does not preclude it from suggesting such measures in the future if assessed to be beneficial to gas customers. Given that Enbridge Gas did not explore, nor did it propose any geothermal applications as part of this proceeding, it is not in a position to provide TRC calculations which it can verify.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Question(s):

(a) Please complete the following table:

Typical Customer – Average Annual Gas Consumption (m3)				
	Total	Space Heating	Water Heating	Other (e.g. stove)
Union Rate Zone - Typical Single-Family Residential Customer				
Enbridge Rate Zone – Typical Single-Family Residential Customer				
Enbridge - Typical Single-Family Residential Customer				

(b) Please complete the following table:

Residential Customer Characteristics – Water Heating					
	Customers with gas water heaters	Average annual water heating load (m3)	Average annual water heating load (BTU)	Average water heating efficiency (AFUE)	Average design day load (m3) from water heating
Enbridge - Typical Single-Family Residential Customer					
Enbridge – Average MURB					
Enbridge – Average Commercial Customer					

(c) Please complete the following table:

Electricity Use – Typical Customer After Conversion to Heat Pumps									
	Average Annual Gas Consumption (m3)			Average Annual Electricity Consumption (ccASHP & HPWP, HSPF Region 5=10[1]) (kWh)			Average Annual Electricity Consumption (GSHP & HPWP, sCOP=5) (kWh)		
	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating
Enbridge - Typical Single-Family Residential Customer									

Response

a) Enbridge Gas is able to provide the average annual gas consumption for typical single-family residential customers for both the Union rate zone and Enbridge rate zone. The Company is in the process of harmonizing its rates for the Rebasing Application which will be filed in Q4 2022. As such, the Company is not able to provide average annual gas consumption of a typical single-family residential customer for Enbridge Gas.

Enbridge Gas is also not able to provide average annual gas consumption by space, water heating, and other as it does not track this information.

Typical Customer – Average Annual Gas Consumption (m3)				
	Total	Space Heating	Water Heating	Other (e.g. stove)
Union Rate Zone - Typical Single-Family Residential Customer	2,200	No data available	No data available	No data available
Enbridge Rate Zone – Typical Single-Family Residential Customer	2,400	No data available	No data available	No data available
Enbridge – Typical Single-Family Residential Customer	No data available	No data available	No data available	No data available

b) Enbridge Gas is not able to provide this as it does not track this information.

c) As mentioned in part a, Enbridge Gas is currently in the process of harmonizing rates and therefore cannot provide this information. In addition, the Company does not track average annual gas consumption by appliance type, and it does not have any data on electricity consumption as Enbridge Gas is a gas utility.

[1] Equivalent to ~sCOP=2.9 (2.96516)

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2, Page 8

Question(s):

(a) Please provide a complete list of the financial incentives and eligibility criteria for the financial incentives for: (i) Residential Savings by Design; (ii) Affordable Housing Savings by Design; and (iii) Commercial Air Tightness Testing.

(b) Please confirm that customers must commit to plan to use natural gas to be eligible for support from Enbridge in the (i) Commercial Savings by Design, (ii) Affordable Housing Savings by Design; and (iii) Commercial Air Tightness Testing. Please explain the rationale for this.

Response

a) A complete list of where the financial incentives and eligibility criteria associated with each of the identified Building Beyond Code offerings can be found in the filed plan is included below.

(i) **Residential Savings by Design:**

Financial Incentives	See Exhibit E, Tab 2, Schedule 2, Page 12 of 33, Paragraph 31, for Energy Star New Homes (ESNH) path See Exhibit E, Tab 2, Schedule 2, Page 13 of 33, Paragraph 33 for NZER Discovery path
Eligibility Criteria	See Exhibit E, Tab 2, Schedule 2, Page 13 of 33, Paragraphs 34 to 38 for Energy Star New Homes (ESNH) path See Exhibit E, Tab 2, Schedule 2, Page 14 of 33, Paragraphs 39 to 42 for NZER Discovery path

(ii) **Affordable Housing Savings by Design:**

Financial Incentives	See Exhibit E, Tab 2, Schedule 2, Page 23 of 33, Paragraph 77
Eligibility Criteria	See Exhibit E, Tab 2, Schedule 2, Page 25 of 33, Paragraph 82

(iii) **Commercial Air Tightness Testing**

Financial Incentives	See Exhibit E, Tab 2, Schedule 2, Page 31 of 33, Paragraph 96
Eligibility Criteria	See Exhibit E, Tab 2, Schedule 2, Page 32 of 33, Paragraph 97

b) DSM Programs are for Enbridge Gas customers as the funding for the programs is recovered from natural gas ratepayers. See part a above for eligibility requirements.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2, Attachment 1, Page 37

Preamble:

See SeeLine Group made the following recommendation to Enbridge:

> "As noted in Section 5, SLG encourages EGI to consider conducting technology potential research on the following ECMs for potential DSM resource acquisition technologies for the commercial new construction market:
> • Solar perforated air collectors,
> • Drain water heat recovery,
> • ASHP-VRF, and,
> • WSHP-VRF"

Question:

(a) Please describe how Enbridge had followed through with the last two bullets of that recommendation (re air source and water source heat pumps).

Response

Upon receiving the final report from SeeLine Group, Enbridge Gas carefully considered all recommendations by not only reviewing the recommendation summary referenced in this question, but by also exploring the more detailed analysis associated with each potential measure identified in the report. As it relates to both the ASHP-VRF and the WSHP-VRF, detailed analysis indicated that there was:

- Limited data to support further in-depth analysis
- Limited applicability or suitability of technologies – technologies were predominantly relevant to new construction sites with specific characteristics
- Preliminary TRC estimates were negative to low in relation to other active measures – partially attributable to higher baselines associated with new construction projects

As a result of the limited applicability, lower TRC values and other challenges highlighted in Section 5 of the SeeLine Group report associated with the measures in question, Enbridge Gas has not prioritized these measures for additional technology potential research at this time.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2, Attachment 2

Preamble:

The report from Building Knowledge Canada notes as follows:

> "Air-to-water heat pump technology has advanced substantially in the last 10 years. With CO2 based ASHW systems, operating COPs of 3.5 to 4+ are possible. These systems can also operate very effectively in Net Zero Ready / Tier 5 type homes as combo/combined space and water heating appliances"
>
> "Lower loads enable more efficient use of air source heat pump technologies, if even for part load conditions."

Question:

(a) Please describe how these conclusions were factored into Enbridge's DSM plan.

Response

a) The new Residential Savings by Design program supports two streams of activities: i) by designing and building more homes to an ENERGY STAR for New Homes (ESNH) or equivalent standard; and, ii) to support the design and construction of NZER discovery homes. The Net Zero Ready Stream supports builders to build to a Net Zero Ready standard or equivalent to Tier 5 type homes. Part of that support includes an IDP Workshop. As referenced in Exhibit E, Tab 2, Schedule 2, page 7 of 33, an IDP Workshop is a collaborative workshop that will bring the participant and their design team together with sustainable design experts in order to strategize how to maximize the project's energy and environmental performance. This is a whole home approach exercise intended to achieve performance levels that meet the Net Zero Energy Ready standard. The report from Building Knowledge Canada mentions many different measures, including heat pumps as cited in this IR, which may be used in the design decision. The design decision outcomes of this workshop will be ultimately at the discretion of the builder participant. Please see Exhibit I.10.EGI.ED.25 part a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Preamble:

These questions on heat pumps relate to a variety of evidence and issues area and are collected here for organizational purposes.

Question:

(a) Please confirm that most Ontarians live in “region 5” for the purpose of Heating Seasonal Performance Factor (HSPF) figures. Please confirm that Region 5 HSPF is most reflective of heat pump performance in the Ottawa region.[1] If not, please explain and provide what Enbridge believes is the accurate alternative information.

(b) Please confirm that the following map reflects NRCan’s projection of region 5 for HSPF calculations in Canada. If not, please explain and provide what Enbridge believes is the accurate alternative information.

[1] E.g. per NRCan - https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about/energy-star-announcements/publications/heating-and-cooling-heat-pump/6817

(c) Please confirm that the climate where a majority of Ontarian's live is similar (or warmer than) to the climate where the majority of Vermonter's live. If not, please explain.

(d) Please confirm that the following report found that the real world performance of 77 cold climate heat pumps in Vermont was, on average, 88% of the manufacturer's nameplate HSPF rating for region 4: The Cadmus Group, *Evaluation of Cold Climate Heat Pumps in Vermont*, November 3, 2017 (link – "The average AHRI nameplate efficiency of the ccHPs was 11.9 HSPF. Through this metering study, we found an average HSPF for the ccHPs of 10.7 kBtu/kWh,10 approximately 88% of the nameplate value.")[2] If Enbridge disagrees with this understanding of the paper or disputes the findings, please explain.

(e) Please confirm that the NRCan energy efficiency ratings for air source heat pumps (split systems) includes (a) over 25 models with an HSPF region 5 rating of 13 or higher and (b) a very large number of models with an HSPF region 5 rating of 10 or higher.[3] If we have misunderstood these ratings, please explain why.

(f) Please confirm that HSPF can be converted to a seasonal co-efficient of performance (sCOP) by multiplying by 0.293. If not, please explain and provide the appropriate conversion.

(g) Please confirm that HSPF ratings for region 4 can be approximately converted to HSPF ratings for region 5 by multiplying by 1.15.[4] If not, please explain and provide the appropriate conversion.

(h) Does Enbridge believe it is appropriate to use NRCan's Energy Efficiency Ratings, and specifically the HSPF region 5 ratings, to assess the cost-effectiveness of measures involving air source heat pumps? If not, why not?

(i) Are the numbers that Enbridge uses to assess the cost-effectiveness of measures involving gas furnaces consistent with NRCan's Energy Efficiency Ratings? If not, why not?

(j) When Enbridge is designing a program for energy efficient equipment, how does it decide on the efficiency threshold for incentive eligibility? Does Enbridge believe that an efficiency eligibility threshold of 10 (HSPF region 5) would be reasonable for a program incentivizing air source heat pumps? What does Enbridge believe would be the range of reasonable efficiency eligibility thresholds (in terms of HSPF region 5) for a program incentivizing air source heat pumps?

---

[2] Note: the nameplate HSPF values are found in appendix A on page 42.
[3] NRCan, Energy Efficiency Ratings Heat pumps, air source, split system (link); sortable excel spreadsheet (link).
[4] NRCan, Energy Efficiency Ratings Heat pumps, air source, split system (link); sortable excel spreadsheet (link).

(k) Please confirm that properly-sized cold climate electric heat pumps can provide 100% of the heating in Ontario's climate region. If Enbridge disagrees, please explain why, explain which portions of Ontario are appropriate for cold climate electric heat pumps, and the approximate percent of Enbridge customers living in those portions of Ontario.

(l) Please describe how electric heat pump water heaters with demand response functionality can assist electric utilities in controlling heating loads.

Response

Preamble:

In general Enbridge Gas's understanding is that NRCan regulates the performance of Single-phase electrical Central Air Conditioners and Heat Pumps in Canada and has proposed Amendment 17 to align with the U.S. Department of Energy (DOE) Energy Conservation Standards (82 FR 1786, Appendix to M1 subpart B, Part 430 of Title 10, M1) which introduces a new test standard and more stringent 'Minimum Energy Performance Standard' (MEPS) for products manufactured on or after January 1, 2023. NRCan had a technical session on January 14, 2021 and a public consultation which ended May 26, 2021. They have indicated the intent to make a formal proposal and public comment period in the Fall of 2021 which has yet to be issued. If the changes materialize as disseminated the result will be equipment performance rating reduction for equivalent climate regions and could alter the Company's responses.

a) Enbridge Gas can agree that most Ontarians live in southern Ontario and therefor HSPF 5 would be the most appropriate climate region for most of the population. Enbridge Gas cannot confirm that Region 5 HSPF is most reflective of heat pump performance in Ottawa because Enbridge Gas cannot confirm the accurate northern limits of Climate Region V. The HSPF performance rating test, as defined by AHRI 210/240 and CSA C656-14, uses physical testing based on Climate Region IV to produce HSPF IV then applies a correction factor to estimate HSPF V, and neither test provides a Canadian Climate Region map. There is no Canadian Climate Region map in these standards to confirm that Ottawa is within Climate Region V or that air source heat pumps operating in Ottawa would reflect HSPF Climate Region V performance ratings.

b) Enbridge Gas can confirm that NRCan has displayed the map in question as a technical discussion item in representing existing Canadian test standard (CSA, C656-17). Enbridge Gas cannot confirm that is represents NRCan's projection for Region 5 HSFP calculations because Enbridge Gas cannot confirm that it accurately reflects AHRI's 210/240 or M1 test requirements, nor has it been officially provided as part of any approved standard or regulation.

c) Weather data available from ASHRAE indicates that cities in Vermont located in weather influenced valleys or along the shores of Lake Champlain have similar weather as found in southern Ontario.

d) The Cadmus report provided does evaluate the in-situ performance of mini-split ductless cold climate heat pumps and did indicate that the equipment performance was lower than the AHRI 210/240 rated HSPF IV value. Most units were not providing whole house heating, and most were adjunct heating systems that were controlled independent from the existing functioning heating system. Essentially the field-testing installations do not reflect the operating characteristics or load profile outlined in the performance rating test and therefore the results are not definitively representing or determining an estimated HSPF V value.

e) (a) Confirmed. Models above a region 5 rating of 13 appear to be predominately ductless mini-splits with low heating capacities.
(b) Confirmed.

f) Confirmed.

g) Confirmed.

h) Yes.

i) Yes.

j) When designing an energy efficiency program, the chosen threshold for incentive eligibility depends on many factors, including the goals of the program, market conditions, and trade-off between performance and cost. Similarly, the reasonable eligibility threshold for a program incentivizing air source heat pumps depends upon the design of the program. There are too many factors at play to universally state a performance threshold, or even a range, for all heat pump programs.

k) Cold climate heat pumps, properly sized, can provide 100% of a home's heating needs in Ontario provided the potential issues associated with sizing for full load can be addressed. This includes ensuring, as noted in NRCan's Air Source Heat Pump Sizing and Selection Guide[7], that the air distribution duct systems can provide adequate air flow for homes designed for traditional furnaces.

l) Enbridge Gas is a gas utility and therefore cannot respond to this.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Question:

(a) What is the winter peak electricity demand from (i) a gas furnace, (ii) a hybrid system, (iii) an air source heat pump (HSPF, region 5, of 10), (iii) an air source heat pump (HSPF region 5 of 10), (iv) a ground source heat pump (sCOP of 5), and (v) resistance heating? Please make and state assumptions as necessary. Please estimate based on an average customer home.

(b) What is the summer peak electricity demand from (i) a traditional central air conditioner (Energy Star rated), (ii) an air source heat pump (Energy Star rated), and (iii) a ground source heat pump (Energy Star rated)? Please make and state assumptions and caveats as necessary. Please estimate based on an average customer home.

(c) What is Ontario's peak electricity load from air conditioning in the summer (MW)? Please make and state assumptions and caveats as necessary.

(d) What is Ontario's peak electricity load from home heating in the winter (MW)? Please make and state assumptions and caveats as necessary.

(e) What is the average annual cooling load (BTU) for an average Enbridge customer with central air conditioning (or for Ontario as a whole)?

(f) Please complete this table of cooling efficiencies:

Cooling Efficiencies of Various Equipment Types			
		SEER	EER
Central air conditioners	Average of current stock (best estimate, Enbridge customers or Ontario average)		
	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Air source heat pumps	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Air source heat pumps in hybrid systems (if different)	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Ground source heat pumps – closed loop	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Ground source heat pumps – open loop	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Cold climate heat pumps – variable speed	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		

Response

a) i – ii) See response below. In order to be helpful, Enbridge Gas can state that no difference is expected in the peak electric consumption from a furnace or a Hybrid Heating system in peak winter conditions, as the Hybrid Heating system would be operating on gas as the heating fuel at peak winter conditions (i.e. gas furnace only mode).

a) iii – v) to f)

Enbridge Gas is a gas distributor not an electric local distribution company ("LDC") and does not maintain electric peak/load end user or system level information in the form requested that can be considered accurate for evidence. The peak for the electric system is not necessarily coincident with the peak for the gas system and may possibly vary for each LDC and the province as a whole.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 3, Schedule 1, Page 2

Question(s):

(a) Please list the incentives and incentive eligibility criteria for all incentives to be provided in the low carbon transition program.

(b) Please provide a breakdown of the proposed low carbon transition program budget for each year by the various offerings (i.e. the portion of the budget allocated to each offering).

(c) For each low carbon transition program offering, please provide a breakdown of the budget as between incentive and non-incentive costs.

(d) Beyond 2024, approximately how much of the market transformation funding will be allocated to the low carbon transition program? We understand that this decision has not been made yet. We are looking for a very rough approximate estimate.

Response

(a) Please see response to Exhibit I.10h.EGI.STAFF.77f and refer to Exhibit E, Tab 3, Schedule 1, pages 5 & 8 for eligibility criteria

(b) - (c)

Please refer to Table 3 and Table 4 in Exhibit D, Tab 1, Schedule 1, pages 11-12 for the 2023 and 2024 Low Carbon Transition program offerings respectively including the breakdown between incentive and non-incentive costs.

(d) As outlined in Exhibit E, Tab 3, Schedule 1, page 1 of the Application, “Enbridge Gas’s Low Carbon Transition program is designed to support the plans of the federal government to bring these types of low carbon technologies to market.”

And as explained in NRCan's Market Transformation Roadmap,[1] the expected timeline to achieve significant Market Transformational goals spans several years, an effort Enbridge Gas is seeking to accelerate in Ontario through DSM programming and resources. Given unavoidable uncertainty regarding the timeframe needed to sufficiently address accessibility, awareness and affordability barriers currently slowing heat pump adoption, to a point where next stage programming may be appropriate, Enbridge Gas's intention is to evaluate progress made by the mid-point assessment to determine the appropriate next steps in driving adoption with these newer low carbon technologies.

The intent with the early efforts of the Low Carbon Transition program includes providing support in the development of necessary infrastructure in the market, supporting contractor and manufacturing market actors, increasing awareness among both contractors and end users and thereby increasing adoption to a point where these technologies could be supported more directly through a resource acquisition type program. In the best case, residential hybrid heating and commercial gas heat pumps would transition following the mid-point assessment. This would be a key determinant of the budget requirement for the Low Carbon Transition program beyond 2024. Another determinant of the budget consideration post-2024 would be the readiness of other low carbon technologies currently in the research phase, such as hybrid commercial rooftop units, to be incorporated into the Low Carbon Transition Program.

If the early efforts of the Low Carbon Transition Program are successful such that heading into 2025:

i. hybrid heating and commercial gas heat pumps are at a point where it makes sense to transition to resource acquisition,
ii. efforts at driving adoption of residential gas heat pumps continue to scale up and continue as part of the Low Carbon Transition Program, and,
iii. additional measures for the commercial market are introduced into the Low Carbon Transition Program (e.g. hybrid rooftop units);then re-allocation of budget towards resource acquisition may be appropriate.

Rough estimates of the budget range for the Low Carbon Transition Program after the mid-point in this scenario could be as follows:

- 2025: $7.5M - $11 M
- 2026: $7.5 M - $16 M
- 2027: $7.5 M - $21 M

[1] Paving the Road to 2030 and Beyond: Market transformation road map for energy efficient equipment in the building sector, Energy and Mines Ministers' Conference, NRCan (August 2018), p. 32.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 3, Schedule 1, Page 2

Preamble:

Enbridge states:

> "The objective of the Residential Heat Pump offering is to accelerate the adoption of hybrid heating systems …

Question(s):

(a) If a home has an existing gas furnace and a central air conditioner at the end of its life, what is the incremental cost of installing a hybrid heating system? Please provide a full breakdown of all assumptions, calculations, and figures, including (a) the cost of replacing the AC with a traditional AC unit (equipment and installation), (ii) the cost of replacing the AC with an efficient air source heat pump capable of hybrid heating and smart fuel switching controls (equipment and installation). Please make sure to break out all the costs and incremental costs separately. Please make and state assumptions as necessary.

(b) If a home owner is replacing their central air conditioner, is upgrading to hybrid heating cost-effective? Please estimate the TRC ratio and net benefits of this on a best efforts basis.

(c) Please describe the smart fuel switching controls necessary for hybrid heating, provide some examples of real world equipment (e.g. manufacturer details), and what they cost.

(d) Will Enbridge be recommending that the heat pump installed for hybrid heating be more powerful than the traditional air conditioning system that would be installed instead? If yes, please provide an example for a traditional home.

(e) In light of the fact that all air conditioning units are heat pumps, what specifications for the heat pump would Enbridge require for a hybrid heating incentive?

(f) How many customers does Enbridge expect to provide an incentive to for a hybrid heating system in each year from 2023 to 2027?

(g) Will Enbridge use a heat pump efficiency threshold for eligibility for incentives for hybrid heating? If yes, what will that be? If not, please explain why and provide an efficiency threshold (or range of thresholds) that Enbridge believes would be reasonable for hybrid heating incentive. Please provide the answers as seasonal COP values applicable to Ontario and as HSPF values (specifying the region).

Response

a) Please see response to Exhibit I.10h.EGI.STAFF.77b.

b) Please see response to Exhibit I.10h.EGI.STAFF.77b to address the cost effectiveness from a homeowner's perspective. As mentioned in Exhibit C Tab 1 Schedule 1 page 17, "Market transformation programs are not amenable to a mechanistic cost-effective screening approach and should be reviewed on a case-by-case basis instead". Therefore, the TRC-Plus test for this nascent program is not representative of expectations for the future cost effectiveness of this technology when market adoption barriers have been removed. However, to assist the OEB with the evaluation of the program a TRC-Plus calculation was estimated for the hybrid heating program as it is proposed today. Based on the Table 1 scenario in Exhibit I.10h.EGI.STAFF.77b, the Net TRC Plus Ratio is -0.24 and the Net Measure TRC Plus is -$4159.

TRC-Plus values are negative due to the following reasons:

1. Currently the incremental installed cost of upgrading from a code-minimum air conditioner to an air source heat pump of equal or greater capacity is significant. Based on information provided from manufacturers, Enbridge Gas believes the incremental cost of heat pumps will come down to the range of $1,500-$2000. This will have a significant positive impact to the TRC Plus values.
2. The TRC calculator understates the benefits of a hybrid heating system. The calculator cannot account for the dynamic operation of a hybrid heating system, where the annual gas savings are expected to increase throughout the equipment useful life as carbon costs increase. The TRC calculator also likely overstates the electrical penalty incurred by a hybrid system because it assumes, for customers on TOU rates, a blended electrical rate and cannot account for the fact that the system operates on low and mid-peak rates. Furthermore, the TRC-Plus ratio is displayed as a negative value (as oppose

to a value between 0 and 1.0, which would traditionally be displayed for a cost-ineffective measure) due to the application of negative electricity benefits and the simplified nature of the current TRC-Plus calculator. Modifications to the calculator would be necessary for this measure to ensure it appropriately reflects the dynamic operation of an integrated heating system.

As a point of comparison, the all electric solution in Table 1 provided in the response to Exhibit I.10h.EGI.STAFF.77b has a Net TRC Plus Ratio of -4.44 and a Net Measure TRC Plus of -$16,869.

c) A description of smart fuel switching controls is provided in the response to Exhibit I.10h.EGI.STAFF.77b. BKR Energy provides smart fuel switching controls through a third party that retails for approximately $140 with an annual subscription of $100. Enbridge Gas is aware of other HVAC equipment manufacturers who are currently developing smart fuel switching controls.

d) Natural Resources Canada's Air Source Heat Pump Sizing and Selection Guide[1] was developed to assist in the proper sizing of heat pumps in Canada. This is a comprehensive guide for contractors to ensure proper heat pump sizing for the retrofit segment. Enbridge Gas will recommend all contractors follow this guide to size heat pumps for the Residential Low Carbon offer.

e) Enbridge Gas will want to ensure the seasonal efficiency of a heat pump is high enough that the overall heating system achieves a seasonal efficiency of greater than 100%. Enbridge Gas also wants to ensure the specifications are not overly stringent to limit the participation of manufacturers. Based on pilot project experience and modelling, the current expectation is heat pumps with a seasonal efficiency greater than HSPF of 9 would be eligible for incentives. This is subject to change as Enbridge Gas continues to gather experience and market intelligence regarding this program.

f) Enbridge Gas estimates it will provide incentives to 1880 customers over 2023 and 2024, for the low carbon residential offer. For budgeting purposes, 855 customers are assumed for 2023 and 1025 customers are assumed for 2024. Incentive support beyond 2024 will be part of the Mid-point assessment.

g) Please see part e above.

[1] Natural Resources Canada, CanmetENERGY Leadership in ecoInnovation, Air-Source Heat Pump Sizing and Selection Guide, Version 1.0 (December 21, 2020). https://www.nrcan.gc.ca/sites/nrcan/files/canmetenergy/pdf/ASHP%20Sizing%20and%20Selection%20Guide%20(EN).pdf

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 3, Schedule 1, Page 2

Preamble:

Enbridge states:

> "The objective of the Residential Heat Pump offering is to accelerate the adoption of hybrid heating systems …

Question(s):

(a) Will customers offered an incentive to upgrade to hybrid heating be given estimates of the impacts on the customer's yearly operating costs before and after the switch? If yes, please provide a live copy of the tool (or draft tool if it is not finalized) used to develop those estimates (presumably an excel spreadsheet). Please provide all underlying calculations and assumptions.

(b) If Enbridge has not already created a tool to estimate operating cost impacts on customers for hybrid heating, will it be creating a tool similar to its "Residential Natural Gas Conversion Savings Estimate" tool? An example can be found at this link.[1]

(c) Please provide the latest master version of the "Residential Natural Gas Conversion Savings Estimate" tool in electronic format (xlsx). We have a copy for one community (see link) but it only has the data for one community.

(d) Please provide the three most recent versions of the "Residential Natural Gas Conversion Savings Estimate" tool in electronic format (xlsx) as used to calculate fuel switching costs in specific communities. We have a copy (see link) but it is outdated and will have been used since that time.

[1] https://www.rds.oeb.ca/CMWebDrawer/Record/673175/File/document

(e) If a home owner is replacing their central air conditioner, is upgrading to hybrid heating cost-effective from the customer's own perspective? Please include all calculations and assumptions.

(f) How long does Enbridge assume that the air source heat pump portion of a hybrid heating system will last for the purpose of cost-effectiveness evaluations? What would the assumed measure-life be for a measure involving an air source heat pump? Please provide any references to studies or data on the longevity of air source heat pumps.

(g) Please complete the following table for an average customer. Knowing that fuel prices vary by location, please provide an Ontario-wide average. Please include all gas and electricity charges that would appear on energy bills (categorized as variable, carbon, and fixed). If estimates of some future prices are not available, please leave those cells blank. Please base the figures on an average customer. For electricity prices, please use a weighted average of the TOU pricing. (Note: The community expansion group will likely have these figures as they are often using tools to assess the cost-effectiveness of fuel switching for customers):

Customer Fuel Prices				
		2020	…	2035
Gas	Variable costs $/m3 (excl. carbon)			
	Carbon price ($/			
	Fixed charges ($)			
Electricity	Variable costs $/kWh			
	Fixed charges ($)			

(h) Please complete the above table for three representative locations in Ontario (e.g., THESL/Enbridge, HONI/Union, HONI/Enbridge).

(i) Seeing as the heat pump portion of a hybrid heating system will not operate below a certain temperature, please provide an average annual COP value that accounts for that fact (which would presumably be higher than a COP value for that region).

Response

a) Enbridge Gas does not plan on providing estimates of the impacts on the customer's yearly operating costs before and after installation of a hybrid heating system.

Enbridge Gas may provide case studies and marketing information presenting reasonable averages of expected savings.

b) Please see response to Exhibit I.10h.EGI.STAFF.77b.

c) The "Residential Natural Gas Conversion Savings" Estimate tool as referenced in this IR and previously provided by Enbridge Gas, is no longer used by the Company to estimate gas savings for a typical residential customer.

d) As mentioned in part c above, there is not a unique tool for each community. The Company does however have an interactive web-based calculator to estimate gas savings for both communities that are currently connected to natural gas, and community expansion projects that are underway. The web-based calculator was created using the same methodology as the excel based "Residential Natural Gas Conversion Savings" Estimate tool as referenced in this IR. The web-based calculator is updated on a quarterly basis to reflect the OEB approved QRAM rates and average market prices for electricity, heating oil, and propane. Please visit https://www.enbridgegas.com/residential/new-customers/community-expansion/calculator and select any community expansion project that is of interest.

e) Please see response to Exhibit I.10h.EGI.STAFF.77b.

f) Under proper maintenance and installation, the life expectancy of a heat pump is estimated at 15 years. Source of the information is provided from multiple manufacturers of heat pumps: Goodman Company Canada, Carrier Enterprise Canada and Napoleon.

g) Please see response to Exhibit I.5.EGI.ED.12f for a typical residential customer's natural gas charges. The Company is unable to provide electricity data as the Company is a gas utility.

h) The Company is unable to provide this as the Company is a gas utility and does not have electricity data.

i) Enbridge Gas is not aware of a test standard to determine the seasonal COP of a heat pump adjusting for the influence of smart controls, therefore Enbridge Gas is not able to determine the seasonal COP.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 3, Schedule 1, Page 2

Preamble:

Enbridge states:

> "The objective of the Residential Heat Pump offering is to accelerate the adoption of … natural gas heat pumps…"

Question(s):

(a) Enbridge states: "Although available in other parts of the world, these systems are not currently available in North America for a typical residential application." Please list three other places where residential gas heat pumps are available and provide a price in those countries for a residential unit converted to $CAD.

(b) Enbridge states: "Residential gas heat pumps are currently not available in North America. They are expected to enter the Ontario market in 2024 at which point they will be incorporated into this offering." What does Enbridge expect gas heat pumps to cost in Ontario for the equipment when they are introduced? Please provide a best estimate and the range of reasonably possible outcomes.

(c) What makes (and models, if known) of residential gas heat pumps are expected to enter the Ontario market in 2024?

(d) What is a representative seasonal COP for a residential gas heat pump? Does Enbridge expect this to apply to those entering the Ontario market in 2024? What heating region would this sCOP apply in?

(e) Please provide Enbridge's best estimate of the seasonal COP for the most efficient residential gas heat pump by 2030 (i.e. if Enbridge is expecting the technology to improve)?

(f) Please provide all studies and research in Enbridge's possession assessing (i) the future role that gas heat pumps can play in decarbonizing space heating and/or (ii) the expected future efficiency levels (sCOP) as the technology improves.

(g) Is there a theoretical maximum seasonal COP for gas heat pumps?

(h) What is a representative COP for a residential gas heat pump at -20 degrees Celsius? Does Enbridge expect this to apply to those entering the Ontario market in 2024?

(i) What is a representative COP for a residential gas heat pump at -30 degrees Celsius? Does Enbridge expect this to apply to those entering the Ontario market in 2024?

(j) What is Enbridge's estimate of the cost to install a gas heat pump in an average home (as a replacement to a gas furnace)?

(k) For comparative purposes, what is Enbridge's estimate of the cost to install a cold climate air source pump in an average home (as a replacement to a gas furnace)? To the extent that this differs from the cost for a gas heat pump, please explain why.

(l) Will Enbridge use a gas heat pump efficiency threshold for eligibility for incentives for gas heat pumps? If yes, what will that be? If not, please explain why and provide an efficiency threshold (or range of thresholds) that Enbridge believes would be reasonable for a gas heat pump incentive. If Enbridge has not made a final decision on this, please provide its initial thinking on the topic and the range of possible outcomes. Please provide the answers as seasonal COP values applicable to Ontario and as HSPF values (specifying the region).

Response

a) Residential gas heat pumps ("GHP") Robur K18 is available in Europe and Vicot V20 is available in China. Retail prices are not available for the North American market since these units are not yet commercially available in North America. Furthermore, prices in those countries may not reflect the cost for the North American market since those units will be required to undergo some changes to adapt to North American codes and standards.

b) and c)

The expected cost of a certified residential GHP unit which is able to supply both space heating and DHW heating is expected to be in the $6,700 range when production models are commercially introduced in Ontario. Certified residential GHPs in the 65,000 Btu/hr - 80,000 Btu/hr heating output capacity are expected to

be available from the following three manufacturers for the Ontario market by 2024: SMTI, ThermoLift, and Vicot.

d) The coefficient of performance ("COP") of a GHP depends on the thermodynamic cycle used in the GHP. Furthermore, the COP also varies with the outdoor air temperature and the water outlet temperature. The COP of a residential GHP would range anywhere from
1.1 - 1.6 depending upon the factors mentioned above. Enbridge Gas would apply the seasonal COP criteria for residential GHPs entering the Ontario market. This criteria applies to all regions of Ontario since GHPs maintain their capacity because the primary source of heat is provided from the combustion of natural gas.

e) As with any other new technology, the performance of GHP technology is expected to increase over time. At this time Enbridge Gas cannot predict the future COP performance of residential GHP by 2030.

f) Please see response to part e.

g) Seasonal COPs are not theoretically derived. They are empirically derived on the basis of test standards. The standard does not define a maximum value.

h) As mentioned under part d, the COP of GHP depends on the type of thermodynamic cycle employed in the GHP system, the outdoor air temperature and the water supply temperature. For absorption type GHP, typically the COP at -20 deg C outdoor temperature and 45 deg C water outlet temperature is expected to be in the 1.2 range. Yes, Enbridge Gas would expect a COP in this range for GHPs entering the Ontario market.

i) For absorption type GHP, typically the COP at -30 deg C outdoor air temperature and 45 deg C water outlet temperature will be in the 1.1 range. Yes, Enbridge Gas would expect a COP in this range for GHPs entering the Ontario market.

j) The total installed cost of a certified residential GHP to supply both space heating and DHW heating is expected to be in the $15,000 range when production models are commercially introduced in Ontario.

k) For the average home the estimated cost to completely replace a furnace with a cold climate heat pump ("CCHP") is on average $11,100[1]. For a furnace replacement scenario, it is assumed that a CCHP would require backup heating due to ductwork limitation highlighted by NRCan's sizing guide.[2] The cost above includes the

[1]Contractor provided quotes & invoices.
[2] Natural Resources Canada, CanmetENERGY, Air-Source Heat Pump Sizing and Selection Guide, Version 1.0 (December 21, 2020). https://www.nrcan.gc.ca/maps-tools-and-publications/tools/modelling-tools/toolkit-for-air-source-heat-pump-sizing-and-selection/23558

replacement of the furnace with an air handler, resistance electric backup heat and the condenser[3]. Where CCHPs replace the furnace, residential gas heat pumps replace the furnace (without the need for a backup heating source), and the domestic hot water appliance.

l) Yes, Enbridge Gas will use a gas heat pump efficiency threshold of greater than seasonal COP of 1.0. This threshold is aligned with Canada's aspirational goal of having all gas appliances to have a greater than 100% efficiency by 2035.

[3] As a practical matter in these scenarios, several manufacturers package their CCHPs with a matching air handler containing an electric resistance backup. See, for example, the Mitsubishi Zuba: https://cdn.agilitycms.com/mesca/productdownloads/mem-202103-e-zuba-brochure-final.pdf

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 3, Schedule 1, Page 2

Preamble:

Enbridge states:

> "The objective of the Residential Heat Pump offering is to accelerate the adoption of hybrid heating systems …"

Question(s):

(a) Has Enbridge conducted any detailed analysis of the comparative overall cost-effectiveness of hybrid systems versus electric cold climate heat pumps in the residential context? If yes, please file that analysis. If not, why not?

(b) Has Enbridge conducted any detailed analysis to determine the conditions under which electric cold climate heat pumps are more cost-effective than hybrid systems, and vice versa, in the residential context (e.g. based on building characteristics, size of load, existing system, end-of-life date of existing equipment, etc.)? If yes, please file that analysis. If not, why not?

(c) Please file or provide a link to any studies that Enbridge has reviewed comparing the relative benefits, costs, and cost-effectiveness of hybrid systems versus electric cold climate heat pumps in the residential context.

Response

a- c) Please see response to Exhibit I.10h.EGI.STAFF.77b.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 3, Schedule 1, Page 2

Preamble:

Enbridge states:

> "The objective of the Residential Heat Pump offering is to accelerate the adoption of … natural gas heat pumps…"

Question(s):

(a) Has Enbridge conducted any detailed analysis of the comparative cost-effectiveness of gas heat pumps versus electric cold climate heat pumps in the residential context? If yes, please file that analysis. If not, why not?

(b) Has Enbridge conducted any detailed analysis to determine the conditions under which electric cold climate heat pumps are more cost-effective than gas heat pumps, and vice versa, in the residential context (e.g. based on building characteristics, size of load, existing system, etc)? If yes, please file that analysis. If not, why not?

(c) Please file or provide a link to any studies that Enbridge has reviewed comparing the relative benefits, costs, and cost-effectiveness of gas heat pumps versus electric cold climate heat pumps in the residential context.

Response

(a) and (b)

Enbridge Gas has not conducted any such analyses. A s indicated at Exhibit E, Tab 3, Schedule 1, page 4, residential gas heat pumps are not available in North America and are expected to enter the Ontario market in 2024, so there is no data or information available to analyze. Additionally, all electric heating solutions with

CCHPs have different applications than residential gas heat pumps and thus their baseline conditions are quite different. The all-electric heat solution replaces a furnace whereas the residential gas heat pump replaces the furnace and the domestic hot water heater.

c) Enbridge Gas is not aware of any such studies.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Environmental Defence

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 3, Schedule 1, Page 6

Preamble:

Enbridge states:

> "The objective of the Commercial Heat Pump offering is to accelerate the adoption of natural gas heat pumps…"

Question(s):

(a) Has Enbridge conducted any detailed analysis of the comparative cost-effectiveness of gas heat pumps versus electric heat pumps in the commercial context? If yes, please file that analysis. If not, why not?

(b) Has Enbridge conducted any detailed analysis to determine the conditions under which electric heat pumps are more cost-effective than gas heat pumps, and vice versa, in the commercial context (e.g., based on building characteristics, size of load, existing system, etc.)? If yes, please file that analysis. If not, why not?

(c) Please file or provide a link to any studies that Enbridge has reviewed comparing the relative benefits, costs, and cost-effectiveness of gas heat pumps versus electric heat pumps in the commercial context.

(d) Please provide the price range for commercial gas heat pumps based on the different size ranges.

(e) Please provide the range of COP values for commercial gas heat pumps based on the different size ranges.

(f) Please provide a comparison in the capital cost of commercial gas heat pumps with an equivalently sized commercial electric heat pumps.

Response

a) Please see response to Exhibit I.10.EGI.BOMA.2a.

b) Please see response to Exhibit I.10.EGI.BOMA.2a.

c) Enbridge Gas is aware of a study recently published by ICF for the Energy Solution Center. The title of the study is, "Comparison of Operational Costs and Lifetime Emissions for Gas and Electric Heat Pumps at Commercial Buildings."[1] Although the study did not include analysis of Ontario climate, it did include a region with heating dominant climate such as Minneapolis. The results showed that gas heat pumps offered the lowest-cost option and produced the lowest total emissions over the 20-year period in each of the evaluated locations.

d) The current equipment prices as per Enbridge Gas's pilot projects are as follows:

- Absorption: $12,000 - $25,000 for GHPs ranging in size from 35 KW - 85 kW
- Engine-Driven: $27,000 for a 50 kW GHP.

e) The COP range depends on the technology type as well as a variety of parameters that are specific to each application. (e.g. ambient temperature, building load and set point)

- Absorption[2]: COP of 1.1 to 1.8
- Engine-Driven VRF[3,4]: Heating COP of 1.1 to 1.6 and cooling COP of 1.1 to 1.7

f) Enbridge Gas believes the only comparison between a natural gas heat pump and an electric heat pump is for the engine-driven VRF technology. Absorption natural gas heat pumps are a more direct replacement for gas boiler and therefore different in operation to an electric heat pump.

An engine-driven VRF heat pump costs $27,000[5] for a 50kW unit while an electric equivalent heat pump is approximately $15,000[6] for the same capacity. Both systems operate using the same indoor units and refrigerant lines so the only cost difference is the outdoor units.

---

[1] ICF, Comparison of Operational Costs and Carbon Emissions for Gas and Electric Heat Pumps at Commercial Buildings, Prepared for Energy Solutions Center (August 2021). https://consortia.myescenter.com/GHP/ESC_GHP_Operating_Costs-Emissions-Study-ICF-August2021-Full.pdf

[2] EB-2021-0002, DSM Multi-year Plan and Framework Enbridge Gas Interrogatory Responses (November 15, 2021), Exhibit I.10i.EGI.CCC.40 Attachment 1, for vendor specific details (Robur, Vicot, SMTI)

[3] Ibid. (Yanmar)

[4] Performance evaluation of 3-Pipe Engine Driven Gas Heat Pump VRF System in Cold Climate. ASHRAE paper presented and published at the ASHRAE Annual 2021 conference.

[5] Based on invoices from manufacturer.

[6] Email communication with manufacturer representative.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Energy Probe Research Foundation (EP)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 2, Page 12

Preamble:

Enbridge's evidence includes this table:

Water Heater	Replace existing natural gas water heater with 0.80 EF or higher tanked ENERGY STAR® qualified natural gas water heater. Or Replace existing natural gas water heater with 0.87 UEF or higher tankless ENERGY STAR qualified natural gas water heater.	$400

Question(s):

(a) Please provide the TRC ratio and net benefits for this measure. Please provide all assumptions and calculations.

(b) What is assumed as the average lifetime of a natural gas water heater (tank and tankless) for the purposes of estimating measure cost-effectiveness?

(c) For a typical home, what is the annual m3 consumption for a gas water heater
- i) that meets minimum standards versus
- ii) one that meets the above criteria (please provide the answer for tank and tankless)?

d) Please provide the efficiency level of gas water heaters:.
- i) an approximate average efficiency of customer gas water heaters,
- ii) the number of customers with gas water heaters,
- di) the approximate number of customers with gas water heaters within the efficiency ranges (80-85%, 85-90%, 90-95%).

e) Please provide an approximate water heater breakdown by housing type if possible (single family, duplex townhouse etc).

f) Please provide an estimate of # combo units

g) Provide the estimated annual residential water heater gas consumption for each Rate Zone (if this differs) and the Total for the franchise.

Response:

a) Please see response to Exhibit I.10.EGI.ED.22b.

b) Please see response to Exhibit I.10.EGI.ED.22a.

c) Enbridge Gas does not have this information.

d) Please see response to Exhibit I.10.EGI.ED.22o.

e) Enbridge Gas does not have this information.

f) Please see response to Exhibit I.10.EGI.ED.22o.

g) Please see below:

Type of home (self-reported)	Base size	Incidence of Natural Gas Water Heater
All single family homes	**2400**	**85%**
Single detached house	1943	85%
A semi-detached house	186	87%
An attached row, townhouse or duplex	208	80%
A condominium bungalow	56	83%
A mobile home	8	* low base size

This data is from the 2020 Residential Single Family Natural Gas End Use Survey (see Exhibit I.10.EGI.ED 22, Attachment 1). It is important to note that this is a self-reported customer driven survey, where customers are asked a set of questions based on their best knowledge.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Energy Probe Research Foundation (EP)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2 & Exhibit E, Tab 3, Schedule 1

Question(s):

(a) Please complete the following table:

Typical Customer – Average Annual Gas Consumption (m3)				
	Total	Space Heating	Water Heating	Other Gas
Union Rate Zone - Typical Single-Family Residential Customer				
Enbridge Rate Zone – Typical Single-Family Residential Customer				
Enbridge - Typical Single-Family Residential Customer				

Response:

a) Please see response to Exhibit I.10.EGI.ED.29a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Energy Probe Research Foundation (EP)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 2, Schedule 2; Exhibit E, Tab 3, Schedule 1

Question(s):

(a) Please complete the following table showing the Savings from installation of an Air-Source heat pump:

	Base Case: Standard Home Average Annual Gas Consumption (m3			Post Retrofit Average Annual Gas Consumption (m3)			Average Annual Electricity Consumption (ASHP & HPWP, HSPF Region 5=10^2) (kWh)		
	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating
Enbridge RZ Typical Single-Family home									
Installed Cost $000									
Simple Payback Yrs	-	-	-						

Response

a) Enbridge Gas does not have the information exactly as asked in the chart above but please refer to the response to Exhibit I.10h.EGI.STAFF.77b which compares hybrid heating with smart controls to an all-electric solution with a cold climate heat pump.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit D, Tab 1, Schedule 1, page 17, Table 10

Preamble:

We would like to understand the assumptions behind the forecast budget in Table 10

Question(s):

Please provide the assumptions behind the almost doubling of the Residential budget with a much smaller (approximate 20%) increase in the Commercial budget.

Response

The forecast number of residential installations for hybrid heating increases by 20% in 2024 compared to 2023 (i.e., from 855 units in 2023 to 1025 units in 2024). Similarly, there is a 20% forecast increase in the commercial installations from 2023 to 2024 (i.e., from 39 units in 2023 to 47 units in 2024). The main reason for the proportionally larger increase in the residential budget is due to the introduction of gas heat pumps to the residential low carbon measure mix. Gas heat pumps are forecast to carry a larger per unit incentive than hybrid heating, see Exhibit I.10.EGI.ED.35a for details.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit D, Tab 1, Schedule 2, page 13

Preamble:

EGI evidence states*: "A portion of the maximum shareholder incentive has been allocated to the multi-year Low Carbon Transition program. This program is designed to increase awareness, training, and installation of heat pump technologies in the province over time aligned with the Pan Canadian Framework as described in Exhibit E, Tab 3, Schedule 1."*

We would like to understand the ratepayer value proposition with regard to this proposed program.

Question(s):

Please provide EGI's perspectives on the nature of these programs relative to the business risk of the utility.

a) Please comment on why the shareholder not only can use ratepayer funds to reduce investment risk BUT ALSO expect a return for using the ratepayer's funds to reduce its risk. Please explain what the shareholder is investing or risking in this proposed program.

Response

The Enbridge Gas shareholder is not investing funds in the proposed Low Carbon Transition Program, and therefore is not taking on any financial risk. The Company is taking on reputational risk as we focus on removing technical and commercial barriers for technology that is not widely adopted at this time.

As stated in Exhibit E, Tab 3, Schedule 1, the Low Carbon Transition Program is influencing the early adoption of next generation heating technologies with efficiencies

greater than 100% and support the federal government's market transformation road map for energy efficient equipment in the building sector. The program aims to address the market barriers to customer adoption in a way that supports their eventual transition to resource acquisition as cost effective measures.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit D, Tab 1, Schedule 3, page 11 including Table 7

Preamble:

We would like to understand the value proposition for ratepayers of this training initiative and how it would be measured.

Question(s):

From EGI's research, for Ontario or EGI franchise area, please provide the current number of:

a) Annual installations of Residential heat pumps
b) Current number of trained contractors
c) Annual installations of Commercial heat pumps
d) Current number of trained engineers

Response

a) Enbridge Gas does not have data on annual installations of residential heat pumps in Ontario, however, the estimated number of total residential heat pumps installed as part of a hybrid heating system so far in Ontario is currently estimated to be under 100 units. Most of the installations are part of a pilot program Enbridge Gas is currently running in London, ON.

b) Enbridge Gas is only aware of 6 contractors that can be considered trained on installing a hybrid heating with smart control system.

c) Enbridge Gas is aware of approximately 16 commercial heat pumps installations in total in Ontario with the earliest installation taking place in 2007.

d) Enbridge Gas is not aware of any design engineers that have undertaken training for gas heat pumps. Consultations with a gas heat pump distributor estimate the number of engineers they have assisted and provided ad hoc training in designing gas heat pumps is under 10 engineers.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit D, Tab 1, Schedule 3, page 11 including Table 7

Preamble:

We would like to understand the value proposition for ratepayers of this training initiative and how it would be measured.

Question(s):

For the purpose of the proposed measurements:

a) How will the number of Residential heat pumps be measured (e.g., only those pumps installed by EGI trained contractors)?

b) How will the number of trained contractors be measured (e.g. those who were trained by EGI or EGI sponsored programs)?

c) How will the number of Commercial heat pumps be measured (e.g., only those pumps installed by EGI trained contractors)?

d) How will the number of trained engineers be measured (e.g. those who were trained by EGI or EGI sponsored programs)?

Response

a- b) Please see Exhibit E, Tab 3, Schedule 1, page 5, Metrics.

c- d) Please see Exhibit E, Tab 3, Schedule 1, page 8, Metrics.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit D, Tab 1, Schedule 3, page 12 including Table 8

Preamble:

We would like to understand the value proposition for ratepayers by adding a stretch target to the cumulative resource acquisition targets.

Question(s):

The summary Table 8 seems to infer that qualified year one savings are assumed to persist for the five years of the framework. Please confirm.

a) Is the practical effect of this metric just adding an additional incentive for meeting a greater than 115% of the resource acquisition targets? Please explain fully the ratepayer value generated by this new, additional incentive based upon Resource Acquisition savings proposed for the shareholder.

Response

Please see response to Exhibit I.8b.EGI.EP.6.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 3, page 4

Preamble:

EGI evidence states: *"Low income programming encompasses the following important components:*
…
• Turnkey, fully funded weatherization programming for income qualified residents of single family and low-rise social housing;"

We would like to understand better the Low-income program and practices related to multi-family residential housing.

Question(s):

Is the turnkey, fully funded weatherization programming available to qualified, privately-owned affordable housing? If not, why not?.

Response

The fully funded weatherization program, Home Winterproofing Program, is only available for Affordable Housing Single Family homes that include private owned affordable housing such as detached, semi-detached and row/townhomes.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 3, page 4

Preamble:

EGI evidence states: *"Low income programming encompasses the following important components:*
…
• Turnkey, fully funded weatherization programming for income qualified residents of single family and low-rise social housing;"

We would like to understand better the Low-income program and practices related to multi-family residential housing.

Question(s):

For the period of 2015-2020, please provide the low-income, resource acquisition savings for multi-family residential buildings. Please provide the results on an annual basis for each legacy utility/rate zone and categorized by social housing or privately-owned buildings.

a) As a result of the savings provided, please comment on strategies that EGI believes will have greatest efficacy and ratepayer value.

Response

The following provides the cumulative natural gas savings (m3) for the low-income multi-family offering achieved each year. Best efforts were made to split results between private buildings and social/assisted buildings in Table 1 below as projects were not initially tracked in this manner for the EGD rate zone.

Table 1
2015-2020 EGD Low-Income Multi-Family CCM Results

	2015	2016	2017	2018	2019	2020 (Draft Audit)
Multi Family - Private	30,234,908	39,805,482	17,015,729	57,876,344	43,040,811	31,944,866
Multi Family - Social	33,734,445	44,923,099	52,348,038	56,292,557	45,916,189	35,692,437
Total	**63,969,353**	**84,728,581**	**69,363,767**	**114,168,901**	**88,957,000**	**67,637,303**

Table 2
2015-2020 Union Low-Income Multi-Family CCM Results

	2015	2016	2017	2018	2019	2020 (Draft Audit)
Multi Family - Private	7,402,426	8,151,190	4,363,656	6,573,109	4,774,193	8,316,698
Multi Family - Social	8,930,935	10,894,573	22,426,926	19,718,214	22,803,825	12,142,699
Total	**16,333,361**	**19,045,763**	**26,790,582**	**26,291,324**	**27,578,018**	**20,459,397**

a) Please see response to Exhibit I.10b.EGI.STAFF.42a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 3, page 19-20

Preamble:

EGI evidence states: *"Privately owned multi-residential building that can demonstrate one of the following criteria:*
• Privately owned multi-residential building owner or property manager must confirm, based on rent roll review, that at least 30% of the units are rented at less than 80% of the median market rent, as determined by the Canadian Mortgage and Housing Corporation;
OR
• Existence of Rent Geared to Income ("RGI") or rent supplement contract(s) with the designated service manager office;
OR
• The building has participated in a federal or provincial affordable housing funding program in the last 5 years.

All privately owned building owners or operators must also sign an agreement to forego Above Guideline Increase ("AGI")."

We would like to understand the effectiveness of the above criteria in identifying and providing low income DSM to privately-owned multi-family buildings under the previous framework.

Question(s):

For the period of 2015-2020, for successful installation of low income DSM initiatives, please provide the percentage of buildings qualified using each of the above criteria.

Response

In 2015-2020 the following percentage qualified for each:

Criteria	**2015-2020 % Qualified**
"Privately owned multi-residential building owner or property manager must confirm, based on rent roll review, that at least 30% of the units are rented at less than 80% of the median market rent, as determined by the Canadian Mortgage and Housing Corporation"	This criteria is new for the 2023-2027 Enbridge Gas DSM Plan. Thus, no participants qualified using this criteria during the previous framework period.
"Existence of Rent Geared to Income ("RGI") or rent supplement contract(s) with the designated service manager office; *OR* *The building has participated in a federal or provincial affordable housing funding program in the last 5 years."*.	Although these qualifications are currently applied for market rate customers in both legacy utility areas, the results were not tracked.
All privately owned building owners or operators must also sign an agreement to forego Above Guideline Increase ("AGI")."	This criteria is new for the 2023-2027 Enbridge Gas DSM Plan. Enbridge Gas did attempt to collect AGI's in the past but did not track results.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Federation of Rental-Housing Providers of Ontario (FRPO)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 3, page 19-20

Preamble:

EGI evidence states: *"Privately owned multi-residential building that can demonstrate one of the following criteria:*
• Privately owned multi-residential building owner or property manager must confirm, based on rent roll review, that at least 30% of the units are rented at less than 80% of the median market rent, as determined by the Canadian Mortgage and Housing Corporation;
OR
• Existence of Rent Geared to Income ("RGI") or rent supplement contract(s) with the designated service manager office;
OR
• The building has participated in a federal or provincial affordable housing funding program in the last 5 years.

All privately owned building owners or operators must also sign an agreement to forego Above Guideline Increase ("AGI")."

We would like to understand the effectiveness of the above criteria in identifying and providing low income DSM to privately-owned multi-family buildings under the previous framework.

Question(s):

Specific to the last qualification, please confirm that the agreement is to forego an Above Guideline Increase associated with work undertaken as part of the Low-income DSM program.

Response

Yes, the Affordable Housing Multi-Residential requests that all privately owned building owners/operators sign an agreement to forego AGI associated with work undertaken as part of the program offer.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Green Energy Coalition (GEC)

Interrogatory

Issue 10

Question(s):

In its description of its Whole Home offering (Exh. E, Tab 1, Sch. 2, pp. 10-15), Enbridge explains that participation requires two major measures – or three major measures if one of the measures is a furnace:

a) Please confirm that the Company considers air sealing with at least a 10% reduction in air leakage to be one such major measure.

b) Would the Company agree that it is often possible to achieve a 10% reduction in air leakage simply by installing an insulation measure over leakage points and/or installing a new directly-vented furnace to replace an older atmospherically-vented or powervented furnace. In other words, is it fairly common to achieve 10% air leakage reduction without any purely air sealing measures? If the Company does not agree, please explain why.

c) Please provide an Excel file that provides the following information for what each participant (separate row, with customer information anonymized, in its 2020 whole home retrofit program:
    a. Pre-project m3 consumption
    b. Post-project m3 consumption
    c. M3 savings
    d. % savings
    e. Whether the project included attic insulation upgrades
    f. Whether the project included wall insulation upgrades
    g. Whether the project included basement wall or ceiling upgrades
    h. Whether the project included air sealing upgrades
    i. What the % reduction in measured air leakage was
    j. Whether the project included a heating system upgrade
    k. Whether the project included a water heater upgrade
    l. Whether the project included window/door upgrades
    m. The total incremental cost of the project

Note that GEC is seeking information akin to that provided by the Company in the attachments to its response to I.GEC.1 in EB-2019-0271.

Response:

a) Confirmed. The target is calculated based on reduction in Air Changes per Hour ("ACH"). The target is set at the minimum value of (0.9 x (D)ACH) or (0.0004 x (D)ACH3 – 0.0312 x (D)ACH2 + 1.0935 x (D) ACH)

b) In some instances homes could achieve 10% air leakage reduction without stand-alone air sealing actions, however the likelihood of this occurring is unknown. The Whole Home offering is a comprehensive retrofit program where savings capture interactive effects of multiple measures including air sealing. The NRCan EnerGuide process provides whole home analysis from all measures installed including air sealing, which is a performance based measure in the Whole Home offering.

   The offering's objectives for air sealing are for homeowners to recognize it as an opportunity for energy savings and occupant comfort, identify the air leakage opportunities throughout the home through the holistic audit and encourage the homeowner to upgrade these opportunities in a comprehensive manner to optimally seal the home inclusive of both stand-alone air sealing activities and building envelope improvements such as insulation. It is important that air sealing opportunities are undertaken throughout the home, both through stand-alone air sealing and those associated with other upgrades, to maximize energy savings.

c) Please refer to Attachment 1.

Attachment 1 has been provided in excel format.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Green Energy Coalition (GEC)

Interrogatory

Issue 10

Question(s):

On p. 3 of Exhibit E, Tab 1, Schedule 2, Enbridge makes reference to the federal government's new Greener Homes Initiative and CMHC's new interest-free loans to support residential deep retrofits. The Company then states that the existence of such non-utility programs suggests "flexibility in the design and delivery of (Enbridge's) Residential program" is needed and that the Company "…is confident in its abilities to coordinate with external parties in the delivery of future residential programming…"

a) How has the design of Enbridge's three proposed residential programs – Whole Home, Single Measure and Smart Home – been structured in light of the Greener Homes Initiative in particular?

b) What specific changes has Enbridge made to any of the following to optimize its residential programs in the context of the details of the Greener Home Initiative offerings:

   i. List of eligible efficiency measures – has Enbridge added or eliminated any measures from its programs in light of the federal program offer? If so, which measures?
   ii. incentive levels for each eligible measure – has Enbridge modified its proposed incentives for any measures or services in light of the federal program offer? If so, which incentives were changed, how were they changed and what was the rationale for the change?
   iii. Customer outreach or marketing strategy – has Enbridge modified its proposed approach to marketing its programs to its customers in light of the federal program? If so, how?
   iv. Budget – has Enbridge modified its proposed program budget in any way (e.g., to reflect the potential for the federal program do drive up participation in Enbridge's program)?
   v. Savings – has Enbridge increased its estimated savings from its program (e.g., to reflect the potential for the federal program to drive up participation in Enbridge's program)?

c) Does Enbridge believe that the federal Greener Home Initiative rebate offerings could reduce the level of rebates it needs to offer for any measures? If so, which measures and by how much? If not, why not?

d) Does Enbridge believe that the simultaneous presence of the federal Greener Home Initiative and its own residential programs could lead to greater participation – and therefore greater budgetary resource requirements – than if the Greener Home Initiative had not been offered? If so, is such greater participation reflected in Enbridge's plan budget? If not, why not?

e) The Company's proposed attribution rules (Exhibit C, Tab 1, Schedule 1, pp. 22-23) suggest that it will need to establish a "partnership agreement" with the federal government to allocate savings between its residential programs and the Greener Home Initiative.
   i. Has such an agreement been developed? If so, please provide it.
   ii. If such an agreement has not yet been developed, what is the Company's expectation regarding when it will be available?
   iii. Has the Company developed such agreements with the federal government in the past? If so, please provide the three most recent examples.
   iv. Is the potential need to "share" savings between the Company and the federal government reflected in the Company's estimated savings from its residential programs and its related shareholder incentive performance metrics? If so, please explain how.

f) If Enbridge has not yet made any changes to its proposed residential programs in response to the federal Greener Home Initiative, but plans to do so in the future, why would it be appropriate for the Board to approve the Company's current plan program mix, budget and savings targets if that plan is not reflective of the actual programs the Company will offer, the cost of those programs and the savings they will produce?

Response:

a -d) Please see response to Exhibit I.10a.EGI.STAFF.31.

f) See Response to Exhibit I.10a.EGI.STAFF.31 e and f.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Sustainable Energy Association (OSEA)

Interrogatory

Issue 10

Reference:

Exhibit D-1-4, Table 1

Preamble:

Enbridge proposed multiple DSM programs in Enbridge's DSM Plan, and presented TRC-Plus ratios for each DSM program that exceed the 1.00 threshold. OSEA is interested in understanding which DSM programs were excluded from Enbridge's DSM Plan and Enbridge's reasoning for excluding these programs.

Question(s):

a) Please provide a complete list of programs that Enbridge considered for the DSM Plan, including a brief description of each program.

b) Please provide the TRC-Plus, Benefit and TRC-Plus Ratio calculations for all DSM programs assessed by Enbridge for inclusion in the DSM Plan. For any program with a TRC-Plus Ratio greater than 1.00 that was excluded by Enbridge from the proposed DSM Plan, please provide Enbridge's reasoning for and analysis conducted to support Enbridge's decision to exclude the program.

c) Did Enbridge perform any sensitivity analysis for DSM programs that did not meet the TRC-Plus Ratio threshold of 1.00? For example, if a program barely missed the threshold, did Enbridge consider errors, omissions or sensitivities that could have possibly increased the TRC-Plus Ratio above the threshold?

d) Did Enbridge use the TRC-Plus Ratio to determine budget allocations? For example, Industrial Programs appear to offer the best TRC-Plus Ratio significantly compared to other programs. Did the TRC-Plus Ratio influence the amount of funds that Enbridge committed to the Industrial Programs? Please explain why Enbridge did or did not use TRC-Plus Ratios to determine budget allocation.

Response

a) In addition to the Programs and offerings included in the proposed DSM Plan, the following additional offerings were considered in the development of the plan:

- Residential Energy Literacy Offering – This offering is designed to communicate the benefits of energy efficiency to residential customers through the provision of tips and assessments to identify low-cost/no-cost efficiency measures and encourage broader engagement in energy efficiency among residential customers.
- Residential Moderate Income Offering – The goal of this offering is to address the needs of the market for those that do not income qualify for the Home Winterproofing offering (HWP) but may not necessarily have the means to participate in the current Home Efficiency Rebate offering available to all Residential customers.
- Indigenous Offering– This DSM offering would be a stand alone offering, specific to on-reserve Indigenous homes, and would include all the offering elements available through the Home Winterproofing offering.
- Operational Improvement Offering – The Operational Improvement offering aims to engage Commercial & Small Industrial customers who are not actively participating in energy efficiency through a combination of energy literacy initiatives, culminating in a site assessment to identify and support the implementation of no-cost/low-cost operational improvement measures.
- Commercial Deep Retrofit Offering –The Deep Retrofit offering targets commercial customers undergoing significant improvements to their facilities that are not restricted by OBC performance requirements. The offer provides participants with a combination of technical and financial support to advance the adoption of high efficiency measures in order to drive a 30% reduction in energy consumption.

b) Please see Exhibit D, Tab 1, Schedule 4, page 2, Table 1 for the 2023 forecast TRC-Plus, Benefit and TRC-Plus Ratios calculations associated with each program and offering in the DSM Plan.

Specific TRC-Plus, Benefit and TRC-Plus Ratios were not calculated for offerings that were not included as part of the DSM Plan.

In preparing the DSM Plan, Enbridge Gas conducted market analyses through reviewing customer participation levels (see response to Exhibit I.9.EGI.STAFF.22), stakeholdering (see response to Exhibit I.17.EGI.PP.48) and conducting market research (see response to Exhibit I.17.EGI.PP.48) in an effort to identify key market barriers and opportunities to improve overall results across the entire DSM portfolio. Jurisdictional scans (see response to Exhibit I.3.EGI.STAFF.1) were then leveraged to support the ideation of different offerings and measures to capitalize on opportunities and overcome market barriers. Of the offerings considered in the process of developing the plan, those that were not pursued, were not pursued for a variety of reasons beyond TRC-Plus forecasted results, as outlined below:

- Residential Energy Literacy Offering – Jurisdictional research revealed that natural gas utilities saw low savings attributed to energy literacy/behavioural based programming. Furthermore, most jurisdictions that offered this type of programming applied a dual-fuel approach which is currently not an option available through CDM programming in Ontario[1].
- Residential Moderate Income Offering – The concept of introducing a moderate income offering was motivated by a program offered through Mass Save in an effort to reach a broader group of residential customers who were ineligible for low income programming and less likely to participate in traditional residential offerings. The decision not to pursue a distinct residential moderate income offering was based on the following factors:
    - Historical participation levels revealed participation among moderate income households was relatively proportionate to participation across the residential market.
    - Low income program eligibility requirements were refined to align with those of the IESO, which increased the number of former residential moderate income households that would qualify for low income programming.
    - Enbridge Gas is already collaborating with the IESO on a moderate income offer that includes smart thermostats as a natural gas measure.
    - The single measure offering provides support for smaller retrofit projects, which could appeal to customers with smaller retrofit budgets.
- Indigenous Offering - Enbridge Gas determined that serving on-reserve Indigenous customers through its existing Home Winterproofing offering is appropriate. The current HWP offering can continue support a customized on-reserve outreach and approach to market while providing flexibility to add new DSM measures with specific eligibility for on-reserve homes, as indicated in Exhibit E, Tab 1, Schedule 3, page 11.
- Operational Improvement Offering – Similar to the Energy Literacy offering, jurisdictional research revealed relatively low savings attributable to these types of behavioural improvement offerings and as a result, the Company believes the savings would not justify a stand-alone Operational Improvement offering. Instead, the Company plans to incorporate operational improvement measures as part of the Commercial Custom offering.
- Commercial Deep Retrofit Offering – The decision not to pursue this offering was based on the fact that many of the components associated with the offering overlapped with the proposed Commercial Whole Building P4P offering which would have resulted in competition between offerings and market confusion.

[1] See Attachment 1 for 2021-2024 Conservation and Demand Management Framework Program Plan published by IESO (January 4, 2021)

c) See answer to part b above.

d) The TRC-Plus cost-effectiveness screening as outlined in the Proposed Framework is intended (consistent with the 2015-2020 DSM Framework) to assist Enbridge Gas in determining which DSM programs should be proposed as part of the DSM Plan. The TRC-Plus test calculations have not however been used to determine relative budget allocations. As expected, industrial and commercial programs are generally (but not always) more cost-effective utilizing the TRC-Plus screening when compared to Residential and Low Income programs. However, budget allocations across each of the major customer sectors and program proposals have been determined with consideration for expectations outlined in the OEB December 1, 2020 DSM Letter; the objectives and guiding principles outlined in the Proposed Framework; and, based on determinations of market opportunities including experience gained from previous DSM delivery.

2021-2024 Conservation and Demand Management Framework

2021-2024 Conservation and Demand Management Framework Program Plan

The Conservation and Demand Management (CDM) Framework Program Plan is an overview of the CDM programs to be delivered by the IESO, under the Save on Energy brand, from January 2021 to December 2024. The plan sets out forecast budgets and, where applicable, savings targets and estimated cost-effectiveness for the portfolio of CDM programs.

The IESO will report on program participation, expenditures against budget, and progress towards demand and energy savings targets, greenhouse gas emission reductions, and additional achievements of the Energy Affordability Program and on-reserve First Nations programs, on an annual and quarterly basis. In addition, the IESO will undertake a formal review of progress and strategy at the midpoint of the framework in late 2022. This review is to ensure that the CDM program offerings, targets, and budget are effectively meeting both electricity system and customer needs. Findings and recommendations from the midterm review may be used to adjust and enhance the CDM program offerings for the second half of the framework.

2021-2024 CDM Framework Overview

The 2021-2024 CDM Framework focuses on cost-effectively meeting the needs of electricity consumers and Ontario's electricity system through the delivery of programs and opportunities to enable electricity consumers to improve the energy efficiency of their homes, businesses and facilities. As Ontario recovers from potential impacts of the Novel Coronavirus (COVID-19), the IESO and government recognize that electricity CDM programs provide continued opportunities for electricity consumers to save on energy costs and are an important contributor to Ontario's economy. Additional focus areas of the framework include:

- Achieving provincial peak demand reductions and implementing targeted approaches to address regional/local system needs using demand side solutions as cost-effective alternatives to traditional infrastructure investments
- Leveraging competitive mechanisms to drive cost efficiencies and support innovative customer based-solutions

Details about the various incentives offered through each program and how to apply for programs is available at SaveOnEnergy.ca.

Budget and Targets:

The plan, which is subject to changes and revisions over time, allocates the 2021-2024 Conservation and Demand Management Framework budget of up to $692 million over the suite of programs and is forecasted to achieve 440 MW of peak demand savings and 2.7 TWh of electricity savings.

Reporting:

As part of its responsibilities, the IESO will publish the verified results of its Evaluation, Measurement, and Verification (EM&V) of the savings resulting from the 2021-2024 CDM Framework, as well as costs related to its activities in support of programs such as audits, capability building and training. The IESO will publish verified program results on a yearly basis, as well as quarterly program updates, to inform the sector on the progress to meeting the targets.

Cost Effectiveness:

Program cost-effectiveness under the 2021-2024 CDM Framework for the CDM Plan is assessed using forecasted program participation and supply side avoided costs – which estimate the cost of supplying that same amount of energy from the current electricity generation mix. The IESO Cost-Effectiveness Guide is available on the IESO website. Cost effectiveness in this plan is based on avoided supply costs developed in the IESO's January 2020 Annual Planning Outlook and may be updated at mid-term subject to changes in updated annual planning outlooks.

2021-2024 CDM Framework Summary Tables

- *The following tables outline the associated budget, electricity and demand savings, and cost-effectiveness of the programs delivered under the 2021-2024 CDM Framework.*

Budget

Program	Budget ($M)			
	2021	2022	2023	2024
Retrofit Prescriptive Program	57.6	54.5	39.0	39.0
Small Business Program	9.1	9.2	5.1	5.1
Energy Performance Program	4.4	3.5	6.9	7.2
Energy Management	3.5	8.3	14.0	14.0
Customer Solutions	0.0	0.0	55.0	55.0
Local Initiatives	15.4	14.5	18.0	17.7
Total Business Programs	**90.0**	**90.0**	**138.0**	**138.0**
Energy Affordability Program	36.7	37.5	38.9	40.2
First Nations Program	9.0	9.0	9.0	9.0
Total Support Programs	**45.7**	**46.5**	**47.9**	**49.3**
Total all Programs	**135.7**	**136.5**	**185.9**	**187.2**
Customer Education and Tools	0.3	0.3	0.3	0.3
Central Services - Business	9.7	9.7	11.7	11.7
Central Services - Support	0.3	0.8	0.8	0.8
Total IESO Services	**10.3**	**10.8**	**12.8**	**12.8**
Total Annual Budget	**146.0**	**147.3**	**198.7**	**200.1**
CDM Framework Total				**692.0**

Peak Demand and Energy Savings

	Peak Demand Savings (MW)				Energy Savings (GWh)			
Program	**2021**	**2022**	**2023**	**2024**	**2021**	**2022**	**2023**	**2024**
Retrofit Program	57.7	54.5	42.2	42.2	354.3	337.8	217.2	217.2
Small Business Program	5.3	3.9	1.9	2.1	40.2	28.5	14.3	15.3
Energy Performance Program	2.8	2.2	4.3	4.5	21.8	17.3	34.1	35.6
Energy Management	2.1	6.8	16.1	16.1	16.4	47.3	115.2	115.2
Customer Solutions	0.0	0.0	44.1	44.1	0.0	0.0	325.7	325.7
Local Initiatives	13.6	12.5	15.7	15.3	52.4	52.4	62.9	62.9
Total Business Programs	**81.3**	**79.9**	**124.3**	**124.3**	**485.0**	**483.3**	**769.4**	**771.9**
Energy Affordability Program	6.1	6.5	6.7	7.0	47.6	50.3	52.3	54.0
First Nations Program	1.2	0.9	0.9	0.9	10.3	7.3	7.3	7.3
Total Support Programs	**7.3**	**7.4**	**7.6**	**7.9**	**57.9**	**57.7**	**59.6**	**61.5**
Total Annual Savings	**88.6**	**87.3**	**131.9**	**132.2**	**542.9**	**541.0**	**829.0**	**833.4**
CDM Framework Total				**440**				**2746**

Program Cost-Effectiveness

	Cost Effectiveness		
	Program Administrator Cost (PAC) Ratio	Levelized Unit Energy Costs ($/MWh)	Levelized Unit Capacity Costs ($'000/MW-yr)
Retrofit Prescriptive Program	2.3	19	118
Small Business Program	1.1	39	308
Energy Performance Program	1.5	31	246
Energy Management	1.5	29	208
Customer Solutions	2.2	22	164
Local Initiatives	1.4	37	148
All Business Programs	**1.9**	**25**	**155**

Technical Notes:

- *Peak demand savings are calculated in accordance with the IESO Evaluation, Measurement and Verification Protocols and Requirements which are available on IESO.ca Peak demand savings and energy savings are persisting savings in 2026.*
- *Budgets are funds committed in the calendar year; energy and demand savings in a calendar year are those resulting from the budget commitment.*
- *Cost effectiveness is calculated in accordance with the IESO's Cost Effectiveness Guide which is available on IESO.ca. Avoided supply costs are based on the IESO's January 2020 Annual Planning Outlook.*
- *As per the September 30th Ministerial Directive, the Energy Affordability Program and First Nation Programs are not required to meet cost effectiveness thresholds as these programs provide significant non-energy benefits not captured through cost-effectiveness analysis.*

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 10

Question(s):

a) Please provide all materials, options and analysis Enbridge has considered to increase DSM funding beyond current levels (i.e. 2021/2022 budget levels)

b) Please provide a list of all options to increase DSM results in Ontario over the 2023-2027 period.

Response:

a) Enbridge Gas considered DSM funding/budgets based on the DSM Letter and utilized the OEB's direction which was both clear and specific, where it stated;

> Over the course of the 2015-2020 term, annual OEB-approved natural gas **conservation budgets have doubled from the previous levels** approved for the 2012-2014 term, up to approximately $140 million per year by the end of the current term. With COVID-19 creating many financial hardships, energy conservation has a role in helping to reduce energy costs and assist customers in managing their energy bills. **The OEB anticipates modest budget increases to be proposed by Enbridge Gas** in the near-term in order to increase natural gas savings, and expects Enbridge Gas to seek to improve the cost-effectiveness of programs. However, the appropriate level of ratepayer funding expended for DSM programs must weigh the cost-effective natural gas savings to be achieved against both short-term and long-term customer bill impacts.[6] ***[Emphasis added]***

The Company ultimately interpreted modest budget increases to be 3% over inflation for the program budgets and inflation only for the portfolio administration as stated in the pre-filed evidence in Table 1 in Exhibit D, Tab 1, Schedule 1.

Prior to being in receipt of the DSM Letter, Enbridge Gas had considered two scenarios as being consistent with the language in the Environmental Plan:

[6] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 3.

"Gradual increase" scenarios: consistent with Environment Plan language

1. +5%/yr from 2021 -2030 – Go from $2/month to $3/month residential impact

2. +10%/yr from 2021-2030 – Go from $2/month to $4/month residential impact

The Company notes that in the quote from the DSM Letter above, the OEB specifically called out a doubling of budgets previously. This was referred to as going from $1/month to $2/month residential impact at that time. After receiving the DSM Letter, the Company decided to go with a version of option #1 above, as this would increase budgets by the same increment as the OEB had noted – i.e. an incremental $1 month over existing levels. The 5% was then disaggregated into 2% for inflation plus 3% real growth, and the decision was made that it was appropriate to have productivity built into the portfolio administration, so this portion of the proposed budget was held flat in real terms.

The above is a description of what the Company considered when increasing budgets above current levels. There are no specific materials, options or analysis beyond what has been described above, as consideration of the budget was based on internal management discussions.

b) Please see response to Exhibit I.10.EGI.PP.30.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 10

Question(s):

Below is a list of some potential options to increase DSM results in Ontario during the 2023-2027 period. Please identify all of the options that are not possible during the 2023-2027 period and explain why.

- Increased DSM program budgets
- Increased DSM incentives for Ontario consumers or communities
- Increased DSM programs
- Increased Enbridge program efficiency
- Increased partnering with industry stakeholders (e.g. IESO, municipalities, etc.)
- Increased stacking of incentives with other program funders
- Others as identified by Enbridge

Response:

Enbridge Gas believes the list of potential options appears to be reasonable and notes that some of the options overlap (such as increased DSM budgets which are required to increase DSM incentives as one example only). These options must of course be considered in light of issues such as resulting bill impacts, cost effectiveness, current market conditions and directives from the OEB.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 10

Question(s):

Please confirm that increased DSM results (i.e. reduced natural gas consumption) results in decreased energy costs for a consumer. If not, please explain.

Response:

Confirmed. Consumers that participate in DSM should benefit from decreased energy costs.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 3, Schedule 1, Page 6 of 9:

Question(s):

"The objective of the Commercial Heat Pump offering is to accelerate the adoption of natural gas heat pumps …".

Are only natural gas heat pumps eligible for the Low Carbon Commercial Heat pump program? If yes, why not electric like the residential version of the program?

Response:

Confirmed. Only natural gas heat pumps are eligible in the Commercial Low Carbon offer.

Please see response to Exhibit I.10.EGI.BOMA.2 for reasons why Enbridge Gas is currently not offering electric heat pumps in the Commercial Low Carbon Offer.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 10

Question(s):

a) Does Enbridge believe that the implementation of air source heat pumps is cost effective? If not why not. If yes, please provide the best available current assumptions and TRC Plus test, including calculations.

b) Please calculate the TRC Plus benefits for each proposed Low Carbon Transition Program and show the calculations.

Response:

a) Enbridge Gas does not believe air source heat pumps are cost effective from a TRC Plus standpoint. Please see response to Exhibit I.10.EGI.ED.36b for an explanation.

b) Please see response to Exhibit I.9.EGI.PP.26 a and b.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 10

Question(s):

Please explain what happens to the Low Carbon Transition Program and Building Beyond Code Program after the first two years (i.e. does it continue with the same metrics and budget escalation or do the metrics change to resource acquisition metrics).

Response:

Please see response to Exhibit I.10.EGI.ED.35d regarding the Low Carbon Transition Program.

After the first two years of the Building Beyond Code Program, it is currently planned that the program will continue with the same metrics and budget escalation, unless there is a code change, or unless there is a fundamental shift in the market, which would then trigger a reevaluation of metrics and budgets to be considered as part of the mid-point assessment.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Pollution Probe (PP)

Interrogatory

Issue 10

Question(s):

a) Please provide a comprehensive list of programs, resources and other support Enbridge proposes to provide Ontario municipalities over the 2023-2027 DSM Plan. Please indicate which items are incremental to the 2022 OEB approved DSM plan.

b) Please provide a list and description of all 2023-2027 DSM budget elements to support municipal energy and emission plan implementation?

Response:

a) The Company did not file program offers which are specific to municipalities. It is the plan to leverage the suite of approved DSM programs through collaborative agreements and joint marketing efforts to support Ontario Municipalities. Municipal energy planning activities will be supported through the 2023 – 2027 program offers which were filed by the company in the "E" series of Exhibits.

   All the Budget items and activities which are incremental to the to the approved 2022 DSM plan can be found at Exhibit E, Tab 4, Schedule 1, pages 3 to 5, paragraph 9 to14. The engagement and support provided to municipalities to date has be accomplished primarily by repurposing existing FTEs with an incremental FTE to support data analysis and analytics identified in Exhibit D, Tab 1, Schedule 1 pages 25 to 26. For 2022 and prior, there was limited financial support for municipal engagement on the design and implementation of energy plans or climate action plans and what was available was a result of some of the efficiencies found through integration.

b) The incremental items outlined in part a above, will support municipalities in the development and execution of Climate Change Action Plans and Municipal Energy Planning.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance (SBUA)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 2

Question(s):

Will small commercial customers installing residential-sized space and water heating equipment be eligible to participate in the residential programs offering rebates for this type of equipment?

Response

No. Residential Program Offerings are open to residential customers, subject to individual offering eligibility as outlined in Exhibit E, Tab 1, Schedule 2.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance (SBUA)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 4, paras. 64-73 (Direct Install Program)

Question(s):

a) Which potential measures were considered for inclusion in the Direct Install Program?

b) For any measures that were rejected, please explain why they were rejected and what conditions would need to be in place from Enbridge Gas's perspective for those measures to be included in the future.

c) Are there some measures that might not be cost effective on average, but might be for particular projects that were excluded? If so, what are those measures?

d) Why aren't all potentially cost-effective measures considered in the Direct Install Program?

e) Why are there no measures in this program that would provide energy costs savings to customers with high water heating needs, such as food service and hospitality customers? What conditions would need to be in place from Enbridge Gas's perspective in order for such measures to be included?

f) What will be the specific criteria for determining the incentives for small commercial customers? For example, will it be designed to reduce the payback period to fewer than a given number of years or cover a given percentage of the incremental cost?

g) Will the Direct Install Program either offer financing or assistance in obtaining financing for projects? If so, what are the specifics?

h) Will on-bill financing be available? If not, was it considered? If considered, why was it rejected? What conditions would need to be in place from Enbridge Gas's perspective for on-bill financing to be included in the future?

Response

a) Please see response to Exhibit I.10c.EGI.STAFF.49a as well as the response to part b below.

b) TRM measures that are already adopted as part of industry standard practice, do not drive sufficient savings relative to their costs, or already have high market penetration rates and limited remaining market potential were excluded from the Direct Install offering. Measures better suited to the Midstream offering are also excluded from Direct Install to avoid market confusion and the potential of double incenting measures. Specifically, the following TRM measures, that are not already part of the Midstream offering, were excluded:

   - Infrared Heaters, ENERGY STAR Dishwashers, Condensing Furnaces – due to their adoption into industry standard practices, and high historical uptake.
   - Multi-Residential Showerheads – Enbridge Gas has focused on measures that drive greater savings

   The above noted measures currently excluded from the offering may be reconsidered for future introduction in cases where specific segments of the market are found to have lower adoption rates of industry standard practices, or where measures with lower natural gas savings can be leveraged as an entry point to engage especially hard to reach customer groups.

c) No, there were no measures excluded due to cost effectiveness in Direct Install.

d) As outlined above in section b), TRM measures that are already adopted as part of industry standard practice, do not drive deep savings, or already have high customer participation rates and limited remaining market potential were excluded from the Direct Install offering. Measures that meet these exclusion considerations would likely be adopted by customers without Enbridge Gas's support, in which case funds are better spent supporting measures that will help customers achieve incremental savings they would not have been able to achieve without the support of the offering.

e) Enbridge Gas has included condensing water heating measures within the Midstream offering (Exhibit E, Tab 1, Schedule 4, Table 3, page 35 of 36). The Midstream offering will also target small commercial customers. In addition, Ozone Laundry will be included in the Direct Install offering.

f) Determining incentive levels for Direct Install is based on minimizing the customer's out-of-pocket cost. Specifically, this is achieved by increasing incentives to cover at least 75% of the incremental equipment cost and up to 50% of the installation costs, as noted in Exhibit E, Tab 1, Schedule 4, page 25, paragraph 76. This level of incentive typically achieves a payback period of less than three years. Incentives

also flow through the service provider so that they are instantly rebated from the sale price. Therefore, understanding the total cost to install the measure is key when designing the incentive level. Input from service providers is also considered when determining what a customer is willing to pay.

g) Enbridge Gas did not include financing for the Direct Install offering, however incentives will typically cover between 75 to 80% of the incremental equipment cost and a portion of the installation costs. (Exhibit E, Tab 1, Schedule 4, page 25, paragraph 76).

h) Enbridge Gas does not provide on-bill financing directly. Registered billers on the Open Bill Access (OBA) program can provide their own financing products. Enbridge Gas acknowledges the OEB Decision in EB-2015-0029/EB-2015-0049 that utilities should not provide on-bill financing to customers as a regulated business activity.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance (SBUA)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 4, Attachment 1, p. 43 (Ipsos Enbridge Gas Commercial Next Gen DSM Planning: Stakeholder Engagement – Report of Qualitative Research Findings)

At p. 43 of its report, Ipsos states the following:

> Driving awareness of available programs and incentives would be an important first step in reaching small and medium sized businesses, as they are often wearing multiple hats within the business and have a lot of information coming their way on many different aspects of their businesses. ***Associations would recommend a multipronged, proactive outreach as the best means to reach and break through to small businesses and would be willing to disseminate energy efficiency/ conservation program information to its membership as they believe they would be a trusted source that could help Enbridge Gas "cut through the noise***". [Emphasis added.]

Question(s):

a) Since cost management is a key priority for small businesses, what specific steps does Enbridge Gas plan to put in place to ensure that energy costs savings opportunities are directly brought to the attention of decision-makers? Put differently, beyond working through service providers, what concrete steps does Enbridge Gas plan to put in place to address the recommendation that there be "multipronged, proactive outreach"?

b) Business associations indicated that they would be "willing to disseminate energy efficiency / conservation program information" to their membership and "believe that they would be a trusted resource that could help Enbridge Gas 'cut through the noise'". What steps will be put in place to leverage the reach of business associations and to provide them with the tools to help their members understand and execute on the available DSM programming?

c) Enbridge Gas's website has energy costs savings calculators organized by industry and measure type. What specific steps does Enbridge Gas plan to put in place to increase awareness and use of those calculators amongst its small commercial customers?

Response

Preamble:
(Relevant to all questions related to Exhibit E, Tab 1, Schedule 4, Attachment 1, Ipsos Enbridge Gas Commercial Next Gen DSM Planning: Stakeholder Engagement – Report of Qualitative Research Findings)

Extrapolations from the *Ipsos Enbridge Gas Commercial Next Gen DSM Planning: Stakeholder Engagement – Report of Qualitative Research Findings,* are intended to provide insights and key themes associated with the commercial market. This research was completed through a qualitative methodology that "is not a representative sample, but rather provides directional, thematic and insight-driven findings... The conclusions drawn, and opinions expressed are those of the researchers"[1] as explained on page 6 of the report. Enbridge Gas has considered the insights and themes from this research in the development of the offers for the commercial market.

a) Enbridge Gas will continue to implement direct-to-customer outreach strategies such as digital and print communications, i.e., direct mail/e-mail campaigns to target decision-makers as well as conduct broader outreach through publications and digital strategies. Further, Enbridge Gas will continue to work with associations to promote its energy efficiency programs through electronic communications, events, publications, and web platforms as well as explore other opportunities available through associations to effectively reach members.

b) Please see response to Exhibit I.10.EGI.SBUA.4c and d.

c) In addition to the interrogatory response at Exhibit I.10.EGI.SBUA.4, Enbridge Gas will continue to implement digital marketing campaigns (i.e., search engine marketing) as part of awareness strategies to reach small commercial customers.

[1] Ipsos, Enbridge Gas Commercial Next Gen DSM Planning: Stakeholder Engagement – Report of Qualitative Research Findings (October 2020), p. 6. Filed at EB-2021-0002, EGI DSM Multi-year Plan and Framework Application, Exhibit E, Tab 1, Schedule 4, Attachment 1.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance (SBUA)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 4, Attachment 1, p. 44 (Ipsos Enbridge Gas Commercial Next Gen DSM Planning: Stakeholder Engagement – Report of Qualitative Research Findings)

At page 44 of its report, Ipsos states:

> Utility / government incentives have been popular and successful in the past in driving small and medium sized businesses to participate in energy efficiency initiatives such as equipment upgrades. ***Providing turnkey or automated solutions, such as monitoring use and alerting businesses about spikes in or high usage, would be ideal***.
>
> As well, ***language and bill simplification, framing the issues and benefits in terms of cost, and avoiding technical terms / speak, would be most helpful to those on the ground running their businesses everyday***, rather than trying to educate them to become energy experts. ***In other words, simplicity and low levels of effort and knowledge is key***.
>
> ***Associations are very willing to partner and collaborate with Enbridge Gas in terms of building education and awareness***; however, while they play an active role in discussing and helping small and medium sized businesses understand whether or not their members are eligible for programs and incentives, associations do not directly help them in filling out applications or executing energy efficiency projects – ***their role is more advisory and in reassuring their members on the legitimacy of programs***.
>
> [Emphasis added.]

Question(s):

a) Is the recommendation to "*provid[e] turnkey or automated solutions, such as monitoring use and alerting businesses about*

spikes in or high usage" being implemented? If so, please explain what specific steps Enbridge Gas plans to take to implement it. If not, please explain why and what conditions would need to be in place from Enbridge Gas's perspective in order to implement the recommendation.

b) Are the recommendations to implement "language and bill simplification, framing the issue in terms of cost, and avoiding technical language / speak" being implemented? If so, please explain what specific steps Enbridge Gas plans to take to implement it. If not, please explain why and what conditions would need to be in place from Enbridge Gas's perspective in order to implement the recommendation.

c) Given that "*associations are very willing to partner and collaborate with Enbridge Gas in terms of building education and awareness*", how does Enbridge Gas plan to work with small business associations in implementing in DSM Plan? Which small business associations does it plan to work with?

d) One way to work with associations may be to enlist their assistance in making the energy cost calculators accessible and available to their members, for example through email campaigns to their members and embedded links on their websites. Does Enbridge Gas plan to work with small business associations to put in place that type of proactive outreach? If so, please explain how, which associations will be engaged and on what timeframe. If not, please explain why not and what conditions would need to be in place from Enbridge Gas's perspective in order to pursue such proactive outreach.

Response

Preamble:
(Relevant to all questions related to Exhibit E, Tab 1, Schedule 4, Attachment 1, Ipsos Enbridge Gas Commercial Next Gen DSM Planning: Stakeholder Engagement – Report of Qualitative Research Findings)

Extrapolations from the *Ipsos Enbridge Gas Commercial Next Gen DSM Planning: Stakeholder Engagement – Report of Qualitative Research Findings* are intended to provide insights and key themes associated with the commercial market. This research was completed through a qualitative methodology that "is not a representative sample, but rather provides directional, thematic and insight-driven findings... The conclusions drawn, and opinions expressed are those of the researchers"[1] as explained on page 6 of the report. Enbridge Gas has considered the insights and themes from this research in the development of the offers for the commercial market.

[1] Ipsos, Enbridge Gas Commercial Next Gen DSM Planning: Stakeholder Engagement – Report of Qualitative Research Findings (October 2020), p. 6. Filed at EB-2021-0002, EGI DSM Multi-year Plan and Framework Application, Exhibit E, Tab 1, Schedule 4, Attachment 1.

a) Enbridge Gas intends to implement turnkey solutions to support small to medium sized businesses in implementing efficiency measures to reduce their energy consumption through the Direct Install offering. Please see Exhibit E, Tab 1, Schedule 4, page 22 for details.

b) Enbridge Gas agrees that communications should be simple and require low level of effort and knowledge to resonate with small commercial customers. Enbridge Gas will develop "sector specific energy literacy tools such as case studies and technology profiles that highlight success stories demonstrating both energy and non-energy benefits (reduced costs, improved comfort, safety, etc.) associated with investing in energy efficiency measures."[2] The language and specific messaging within these materials will be designed for small commercial customers, recognizing the need for simplification.

c) Working with associations has been part of Enbridge Gas's outreach and engagement for many years. Engagement activities include but are not limited to: association membership, in many cases Enbridge Gas staff have participated on Boards or Committees, attendance and presentations at tradeshows and events, as well providing content for associations to communicate to members through newsletters, emails and online (web). Enbridge Gas intends to continue these types of activities in implementing the DSM Plan. Specific small business associations Enbridge Gas works with include, but are not limited to, Ontario Chamber of Commerce (including local chambers across Ontario), Ontario Restaurant Hotel & Motel Association, Federation of Rental Providers of Ontario and local property management associations.

d) Customer perceptions of the usefulness of energy cost calculators were mixed, with some indicating the tool would need to be very simple, easy-to-use and turnkey, and others feeling as though this is a service already provided by third parties (Exhibit E, Tab 1, Schedule 4, Attachment 1, page 37). Therefore, Enbridge Gas will continue to work with associations to ensure simple to use calculators are made available to association members, however it is anticipated that enabling service providers to support small commercial customers by leveraging this type of assessment tool will have a greater impact on customer engagement in energy efficiency programming.

[2] EB-2021-0002, DSM Multi-year Plan and Framework Application (May 3, 2021), Exhibit E, Tab 1, Schedule 4, p. 8.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance (SBUA)

Interrogatory

Issue 10

Reference:

Exhibit E, Tab 1, Schedule 4, p. 19 (Commercial Custom Offering)

Question(s):

a) Are commercial and industrial customers of any size allowed to participate in the Commercial Custom Program?

b) Did Enbridge Gas consider offering a component of the Commercial Custom Program for small commercial customers (less than 100,000 m3/year) with higher incentive levels, but still allowing for consideration of any cost-effective measures – unlike the limited measure options in the Direct Install Program which is confined to a limited set of measures? If not, why not? If so, why was it rejected?

c) For each of the programs addressing commercial customers, please provide the total customer incentive dollars and annual gas savings for small commercial customers (less than 100,000 m3/year). Please provide this for each of the plan projected years and each of the historic years back to and including 2018.

d) Please provide the rate and bill impacts of the planned DSM programs for a typical small commercial customer (less than 100,000 m3/year).

e) Please provide the rate and bill impacts of the expected (100% achievement) and maximum (150% achievement) shareholder incentives for a typical small commercial customer (less than 100,000 m3/year).

Response

a) Yes, the Custom offerings are available to commercial and industrial customers of all sizes, with the exception of customers under rate classes T2 and R100 in Union rate zone, who are supported directly through the Large Volume program.

b) In place of introducing higher incentives for small commercial customers, targeted limited time offers (LTOs) with increased incentives and/or enhanced enabling services, such as funding towards assessments, will be made available to small commercial customers to encourage engagement and participation in the offering. This will allow for more flexibility in testing different incentive structures to motivate broader participation. Furthermore, incentives alone will not be enough to support project uptake. Challenges associated with identifying and creating awareness of opportunities for improvement can present an even larger barrier to participation. For this reason, efforts will also be placed on providing tools and training to enable service providers to support a broader group of customers in identifying and quantifying efficiency opportunities, as outlined in Exhibit E, Tab 1, Schedule 4, pages 19-20, paragraph 55.

c) Enbridge Gas did not previously track results and spend based on the 100,000m^3/yr threshold. Please refer to the table below for the 2023-2027 projection.

	2023	**2024**	**2025**	**2026**	**2027**
Small (<100,000 m^3) Cust. Annual Gas Savings (m^3) [1]	**8,914,062**	**9,076,237**	**9,257,762**	**9,442,917**	**9,631,775**
Small (<100,000 m^3) Cust. Annual Budget	**$7,354,884**	**$7,501,981**	**$7,652,021**	**$7,805,061**	**$7,961,163**

[1] 2024-2027 targets are calculated by applying the Target Adjustment Mechanism (TAM) as illustrated in the Proposed Framework and assuming 100% of the previous year's budget is spent and 100% of the previous year's target is achieved.

d) Please see Attachment 1 which provides the 2023 DSM budget bill impacts for a typical commercial customer consuming 22,606 m^3, 73,000 m^3 and 93,000 m^3 in the EGD, Union South and Union North rate zones, respectively. Note, the bill impacts are calculated based on the total 2023 DSM budget allocated to each of the respective rate classes and is not limited to the projected DSM budget for customers with annual consumption of less than 100,000 m^3. For example, the 2023 DSM budget allocation to Rate M2 in the Union South rate zone of $11.257 million is based on the participation of customers consuming both less than and greater than 100,000 m^3/year within the rate class. Please see Exhibit F, Tab 1, Schedule 2 and Schedule 3 for the DSM budget allocation and associated bill impacts.

e) Please see Attachment 2.

ENBRIDGE GAS INC.
2023 - 2027 DSM Plan
2023 DSM Budget Bill Impacts - Typical Commercial Customer

Line No.	Rate Class	2022 DSM Budget in Rates (1) ($000s)	2023 Proposed DSM Budget (2) ($000s)	Change (%)	2021 Billing Units (10^3m^3)	2022 DSM Unit Rate (cents/m^3)	2023 Proposed DSM Unit Rate (3) (cents/m^3)	Representative Annual Billing Units (4) (m^3)	2023 DSM Amounts in Total Bill		2023 Budget Change Impact ($ / customer)	April 2021 QRAM Total Bill (5) ($)	2023 DSM Budget	
									Annual ($)	Monthly ($)			Total Bill (%)	Change Impact (%)
		(a)	(b)	(c)=(b-a)/(a)	(d)	(e)=(a/d)*100	(f)=(b/d)*100	(g)	(h)=(f*g)/100	(i)=(h/12)	(j)=(f-e)*(g)/100	(k)	(l)=(h/k)	(m)=(j/k)
	EGD Rate Zone													
1	Rate 6	21,074	23,823	13%	4,923,001	0.4281	0.4839	22,606	109	9	13	8,088	1.4%	0.2%
	Union South Rate Zone													
2	Rate M2	10,658	11,257	6%	1,340,433	0.7951	0.8398	73,000	613	51	33	20,759	3.0%	0.2%
	Union North Rate Zone													
3	Rate 10	3,127	3,264	4%	359,134	0.8706	0.9087	93,000	845	70	35	32,092	2.6%	0.1%

Notes:
(1) Equal to the 2021 Board-approved DSM budget, consistent with what was included in the 2022 Rates application (EB-2021-0147, Exhibit D, Tab 2, Rate Order, Working Papers, Schedule 10, p. 1).
(2) Exhibit F, Tab 1, Schedule 2.
(3) 2023 proposed DSM unit rates calculated based on 2021 billing units. At the time of filing the application, the available billing units to calculate DSM unit rates are for 2021.
(4) Based on a typical commerical customer's consumption in each rate zone consistent with typical bill impacts presented with each QRAM.
(5) Total sales service bill based on EB-2021-0070 (April 2021 QRAM) excluding cost/price adjustments.

ENBRIDGE GAS INC.
2023 - 2027 DSM Plan
DSMI Bill Impacts - Typical Commercial Customer

Line No.	Rate Class	2023 Proposed DSM Budget (1) ($000s)	2023 Proposed DSM Budget + 100% DSMI (2) ($000s)	Total 100% DSMI Impact ($)	2021 Billing Units (10^3m^3)	100% DSMI Unit Rate (3) (cents/m^3)	Representative Annual Billing Units (4) (m^3)	100% DSMI Impact ($ / customer)	April 2021 QRAM Total Bill (5) ($)	100% DSMI Impact (%)
		(a)	(b)	(c)=(b-a)	(d)	(e)=(c/d)*100	(f)	(g)=(e)*(f) / 100	(h)	(i)=(g/h)
	EGD Rate Zone									
1	Rate 6	23,823	26,271	2,448	4,923,001	0.0497	22,606	11	8,088	0.1%
	Union South Rate Zone									
2	Rate M2	11,257	11,879	622	1,340,433	0.0464	73,000	34	20,759	0.2%
	Union North Rate Zone									
3	Rate 10	3,264	3,398	134	359,134	0.0373	93,000	35	32,092	0.1%

Notes:
(1) Exhibit F, Tab 1, Schedule 2.
(2) Exhibit F, Tab 1, Schedule 2, plus 100% shareholder incentive. Maximum shareholder incentive is calculated based on 100% target achievement in Annual Scorecards and Max Net Benefits achievement, as per Exhibit D, Tab 1, Schedule 2, Table 11.
(3) DSM unit rates calculated based on 2021 billing units. At the time of filing the application, the available billing units to calculate DSM unit rates are for 2021.
(4) Based on a typical commerical customer's consumption in each rate zone consistent with typical bill impacts presented with each QRAM.
(5) Total sales service bill based on EB-2021-0070 (April 2021 QRAM) excluding cost/price adjustments.

ENBRIDGE GAS INC.
2023 - 2027 DSM Plan
DSMI Bill Impacts - Typical Commercial Customer

Line No.	Rate Class	2023 Proposed DSM Budget (1) ($000s)	2023 Proposed DSM Budget + 150% DSMI (2) ($000s)	Total 150% DSMI Impact ($)	2021 Billing Units (10^3m^3)	150% DSMI Unit Rate (3) (cents/m^3)	Representative Annual Billing Units (4) (m^3)	150% DSMI Impact ($ / customer)	April 2021 QRAM Total Bill (5) ($)	150% DSMI Impact (%)
		(a)	(b)	(c)=(b-a)	(d)	(e)=(c/d)*100	(f)	(g)=(e)*(f) / 100	(h)	(i)=(g/h)
	EGD Rate Zone									
1	Rate 6	23,823	28,710	4,888	4,923,001	0.0993	22,606	22	8,088	0.3%
	Union South Rate Zone									
2	Rate M2	11,257	12,499	1,242	1,340,433	0.0927	73,000	68	20,759	0.3%
	Union North Rate Zone									
3	Rate 10	3,264	3,531	268	359,134	0.0746	93,000	69	32,092	0.2%

Notes:
(1) Exhibit F, Tab 1, Schedule 2.
(2) Exhibit F, Tab 1, Schedule 2, plus 150% shareholder incentive. Maximum shareholder incentive is calculated based on 150% target achievement in Annual Scorecards and Max Net Benefits achievement, as per Exhibit D, Tab 1, Schedule 2, Table 11.
(3) DSM unit rates calculated based on 2021 billing units. At the time of filing the application, the available billing units to calculate DSM unit rates are for 2021.
(4) Based on a typical commerical customer's consumption in each rate zone consistent with typical bill impacts presented with each QRAM.
(5) Total sales service bill based on EB-2021-0070 (April 2021 QRAM) excluding cost/price adjustments.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.2 & 9

Question(s):

Enbridge Gas notes that it is exploring efforts to support moderate income customers by coordinating with the IESO on the Smart Home offering.

a) Please provide more details of this proposal, including if Enbridge Gas and the IESO have an agreement in place to conduct joint/combined delivery.

Response

As referenced in the Low Income Program evidence,[1] Enbridge Gas has aligned income eligibility for the Home Winterproofing Program ("HWP") with the IESO's Energy Affordability Program ("EAP"), and had started discussions with IESO about a possible coordinated delivery of single family low income offerings.

Since that time, Enbridge Gas and the IESO have signed a Memorandum of Understanding and released a joint Request for Proposal ("RFP") to establish a co-delivery model with third party Delivery Agents ("Das") for the HWP and EAP offerings.

The procurement process to secure DAs to deliver both programs in defined geographic areas across Ontario is underway, with the expectation that contracts will be executed, and the DAs will be in place in early 2022.

As referenced in the Residential Program evidence,[2] Enbridge Gas is also working with the IESO on coordinating with their EAP to target moderate income customers with an enhanced incentive for the purchase of a Smart Thermostat. Enbridge Gas will pay for the incentive and claim the energy savings on these Smart Thermostats.

[1] EB-2021-0002, DSM Multi-year Plan and Framework Application (May 3, 2021), Exhibit E, Tab 1, Schedule 3, p. 6.
[2] Ibid, Schedule 2, p. 20.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.3

Question(s):

Enbridge Gas acknowledges the presence of the federal government's funding for residential customer energy efficiency upgrades, Natural Resource Canada's Greener Homes Programs.

Enbridge Gas acknowledges the CMHC program targeted at completed deep home retrofits through interest-free loans worth up to $40,000.
Enbridge Gas proposes that the OEB allow flexibility in the design and delivery of its Residential program to best support all stakeholders and allow for coordinated and responsive DSM programming that can adapt with external efforts.

a) Please discuss the communications Enbridge Gas has had with NRCan on the roll-out of the federal program in Enbridge Gas's service territory. In your response, please discuss any overlap between the two programs.

b) Please provide a detailed comparison, including offering delivery, measures included, and customer incentives between Enbridge Gas's proposed whole home offering and the NRCan greener homes program.

c) Please discuss the communications Enbridge Gas has had with CMHC and how Enbridge Gas's proposed program will interact with the CMHC program.

d) Please provide a detailed comparison, including offering delivery, measures included, and customer incentives between Enbridge Gas's proposed whole home offering and the CMHC's program.

e) Please discuss what specific flexibility Enbridge Gas is seeking approval from the OEB.

f) Please discuss how Enbridge Gas's residential DSM program budget would be deployed should the OEB grant the request for additional flexibility.

g) Please discuss how Enbridge Gas's residential DSM program scorecard, metrics and targets would be impacted should the OEB grant the flexibility requested. In your response, consider a scenario where program activity is 50% less than anticipated and 100% greater than anticipated due to the existence or removal of other similar programs in the market concurrently.

Response

a) As referenced in the Residential Program Evidence (Exhibit E, Tab 1, Schedule 2, page 3), the Canada Greener Homes Grant ("CGHG") initiative was announced by the federal government in the fall of 2020. Since that time, details of the CGHG program have been announced and Enbridge Gas has been in discussions with NRCan on a possible partnership model for Ontario.

   The Company approached NRCan in December 2020 to indicate our desire to coordinate program delivery, however, investor owned utilities were excluded from initial discussions on provincial coordination. On September 3, 2021, the Ontario Ministry of Energy ("MOE") sent a letter to NRCan (see Attachment 1) to encourage coordination between the CGHG program and Enbridge Gas's already established Home Efficiency Rebate ("HER") program, and to communicate the MOE's support of a co-delivery model in Ontario.

   As shared in the letter filed by Enbridge Gas with the OEB on October 28, 2021, discussions between Enbridge Gas and NRCan are on-going and a timeline for finalizing any agreement is unknown at this time. The Company will commit to updating its Residential Program evidence and budget accordingly should a partnership agreement with NRCan be reached.

   The Company notes that the principle under which discussions have started was "to not displace or duplicate provincial programs," as outlined in Attachment 1. Enbridge Gas does not anticipate at this time that material changes will be proposed to the budget allocation of the HER program offering within the Residential budget as is consistent with the principle of the GHGP not displacing existing programming. The Company also believes the performance metrics as filed will be unaffected.

b) Please see Attachment 2.

c) Enbridge Gas has not had substantive communications with CMHC about the program and does not have access to any information on this program beyond what has already been made public.

d) See c) above.

e) Discussions between Enbridge Gas and NRCan are on-going and a timeline for finalizing any agreement are unknown at this time. The Company will commit to updating its Residential Program evidence and budget accordingly should a partnership agreement with NRCan be reached.

f) See e) above.

g) See e) above.

Ministry of Energy

77 Grenville Street
5th Floor
Toronto ON M7A 2C1

Tel: (416) 327-5555

Ministère de l'Énergie

77, rue Grenville
5e étage
Toronto ON M7A 2C1

Tél: (416) 327-5555

Ontario

Conservation and Renewable Energy Division
Division de l'efficacité énergétique et des énergies renouvelables

September 3rd, 2021

Mollie Johnson, Assistant Deputy Minister,
Natural Resources Canada (NRCan)
580 Booth Street, Ottawa
Ontario K1A 0E4

Dear Mollie:

I am writing to you to congratulate you on the launch of the Greener Homes Grant program in May of this year and to encourage Natural Resources Canada ("NRCan") to co-ordinate its program with already established programs in Ontario. It is my understanding that a key principle of the Government of Canada in terms of its program delivery is to implement the programs in such a manner as to not displace or duplicate provincial programs. We are very supportive of this approach.

In Ontario, Enbridge Gas Inc. ("Enbridge") delivers a Home Efficiency Rebate program, which, similar to the federal Greener Homes Grant, offers financial rebates for eligible measures such as insulation to homeowners who enrol in the program and complete energy assessments using an NRCan-qualified energy advisor. This program is funded through Ontario natural gas ratepayers, and is an important part of the company's Demand Side Management (DSM) Plan, as approved and overseen by the Ontario Energy Board (OEB) – Ontario's independent energy regulator. Enbridge is also the primary natural gas distributor in the province, serving 99% of Ontario's natural gas customers. Three-quarters of Ontario homes are heated by natural gas as their primary fuel source.

I would therefore like to take this opportunity to communicate the Ministry of Energy's support for NRCan's consideration of Enbridge for co-delivery of the federal Greener Homes Grant in Ontario. We acknowledge that Enbridge is an independent corporate entity and, by copy of this letter, also wish to reflect the Ministry's support to Enbridge in its co-operative and collaborative efforts to participate with NRCan in the co-delivery of programming.

Alignment with Greenhouse Gas (GHG) Reduction Targets

Importantly, a close coordination between federal and provincial program administrators can reduce negative impacts to the performance of programs, and reducing duplication of benefits and the measurement of results, such as eliminating double dipping for incentives by participants and double counting of results by program administrators, to maximize the prudent use of funds as well as the achievement of energy and greenhouse gas savings. This

approach should support co-ordinated and coherent program delivery as well as program assessment, evaluation and measurement models for both the province and NRCan.

Supporting Ontario's Economic Recovery

The Ministry recognizes that coordination between federal and provincial programs is in the best interest of Ontarians, program customers, the supply chain of vendors and contractors in Ontario (including energy advisors), and aligns with NRCan principles for the Greener Homes Program.

In summary, I believe that NRCan's co-operative approach involving exploring co-delivery of the Greener Homes Program with Enbridge is highly supportive of the above-noted principles and has the potential to assist Ontario and Canada in achieving larger program results than either could achieve without that co-operative approach.

I hope this letter is of assistance to you and look forward to NRCan's continued efforts to help achieve common policy objectives, while delivering value for Ontarians.

Sincerely,

Kelly Brown
Assistant Deputy Minister, Ontario Ministry of Energy

c: Stephen Rhodes, Deputy Minister, Ministry of Energy
Malini Giridhar, Vice President, Business Development and Regulatory Affairs, Enbridge Gas Inc.

Greener Homes Criteria**	HER Measure Criteria	Greener Homes Incentive	HER Incentive	CMHC Program****
Financing				
N/A				up to $40,000
Energy Audits				
ENERGuide Pre & Post Evaluations		$600		Unknown
Attic/Cathedral Insulation*				
N/A	Increase attic insulation from R-35 or less to at least R-60.		$750	Unknown
Increase attic insulation to at least R50 from less than R12	N/A	$1,800		
Increase attic insulation to at least R50 from R12 – R25	N/A	$600		
Increase attic insulation to at least R50 from R25 - R35	N/A	$250		
Increase cathedral/flat roof insulation to at least R-28 from R12 or less	N/A	$600		
Increase cathedral/flat roof insulation to at least R-28 from R12 – R25	N/A	$250		
Upgrade uninsulated cathedral ceiling/flat roof to at least R20	Increase insulation to a cathedral/flat roof by at least R-14.	$600	$650	
Upgrade cathedral ceiling/flat roof to at least R20 from R12 or less		$600	$600	
Exterior Wall Insulation*				
Add at > R20 to 100% of building		$5,000	$3,000	Unknown
Add insulation value of R12 – R20 to 100% of the building	Add at least R-9 to 100% of building to achieve a minimum of R-12	$3,800	$1,750	
Add insulation value of R7.5 – R12 to 100% of the building	Add at least R-3.8 to 100% of building to achieve a minimum of R-12.	$3,300	$1,000	
Exposed Floor Insulation*				
Add at least R20, must insulate entire exposed floor area	N/A	$350	$0	Unknown
Basement Insulation*				
Seal and insulate at least 80% of basement header to add a min R-20	N/A	$240	$0	Unknown
Seal and insulate at least 50% of entire basement slab by a min R-3.5	N/A	$400	$0	
Add Insulation greater than R-22	Add at least R-23 to 100% of basement wall.	$1,500	$1,250	
Add insulation value of R-10 to R-22	Add at least R-12 to 100% of basement wall.	$1,050	$750	
Add insulation value greater than R23 to 100% of exterior crawl space wall area, including header	For adding at least R-23 to 100% of crawl space wall.	$1,300	$1,000	
Add insulation value of R10 – R22 to 100% of exterior crawl space wall area, including header	For adding at least R-12 - R22 to 100% of crawl space wall.	$1,040	$500	
Insulate 100% of the crawl space ceiling (preferably with minimum continuous insulation)	Add value greater than R-24 to 100% of crawlspace ceiling	$800	$1,000	
Furnace/Boiler				
N/A	For replacing a less than 96% AFUE natural gas furnace with a 96% AFUE or higher condensing natural gas furnace	$0	$250	Unknown
N/A	For replacing a less than 90% AFUE natural gas boiler with a 90% AFUE or higher condensing natural gas boiler.	$0	$1,000	
Space Heating Heat Pump**				
Install a Earth Energy Heat Pump – full system (geothermal system)	N/A	$5,000	$0	Unknown
Replace a Earth Energy Heat Pump unit – pump	N/A	$3,000	$0	
Air source heat pumps (ASHP)	N/A	$2,500	$0	
	N/A	$4,000		
Cold Climate Heat Pumps (CCHP)	N/A	$5,000	$0	
Water Heating				
N/A	Install Energy Star natural gas 0.77 EF/0.80 UEF (tank) or 0.87 UEF (tankless) water heater	$0	$400	Unknown
Replace domestic water heater with an ENERGY STAR certified domestic hot water heat pump (DHW-HP)	N/A	$1,000	$0	
Windows & Doors				
Install ENERGY STAR® qualified window, door		$85	$40	Unknown
Install ENERGY STAR® Most Efficient qualified window, door	N/A	$210		
Air Sealing				
Target		$550	$100	Unknown
Target + 10%		$810	$150	
Target + 20% or more		$1,000		
Renewable Energy System				
Install solar panels (photovoltaic (PV) system) ≥ 1.0 kW	N/A	$1,000 per kW	$0	Unknown
Resiliency Measures (must be combined with another retrofit)				
Batteries connected to Photovoltaic systems	N/A	$1,000	$0	Unknown
Roofing Membrane	N/A	$150	$0	
Foundation water-proofing	N/A	$875	$0	
Moisture proofing crawl space floor, walls and headers	N/A	$600	$0	
Thermostat (must be combined with another retrofit for programmable thermostat)				
Replace a manual thermostat with a programmable thermostat	N/A	$50	$0	Unknown
Replace a manual thermostat with a smart / adaptive thermostat	N/A - included in Smart Home offering	$50	$0	
Multi Measure Bonus***				
N/A	3 Measures	$0	$150	Unknown
N/A	4 Measures	$0	$500	
N/A	5+ Measures	$0	$750	
N/A	Insulate 100% of basement	$0	$500	

* Rebates are pro-rated based on the percentage of total wall area upgraded—a minimum of 20% must be upgraded

**Full eligibility requirements found at https://www.nrcan.gc.ca/energy-efficiency/homes/canada-greener-homes-grant/start-your-energy-efficient-retrofits/plan-document-and-complete-your-home-retrofits/eligible-grants-for-my-home-retrofit/23504#s2

***Bonus's capped at a max of $750

****Based on Fall 2020 Economic Statement

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.3

Question(s):

Enbridge Gas notes several barriers to the success of its proposed residential program, including customers unaware of the available efficiency upgrades and contractors who do not know the financial incentives available.

a) Please provide a more detailed description of how Enbridge Gas will expand its customer engagement through additional customer facing energy literacy tools.

b) Please discuss the level of resources and costs proposed to be directed at enhancing market engagement by leveraging client-contractor relationships.

Response

a) Energy literacy has been, and will continue to be, an important aspect of the Company's DSM programs. Enbridge Gas recognizes the importance of energy conservation education and messaging and will continue to expand and increase its customer facing energy literacy tools. For Enbridge Gas residential customers, Enbridge Gas will continue to introduce and expand on the energy literacy elements both within its marketing material and in its program delivery approach, consistently across both legacy utility franchise areas.

   Energy literacy through program delivery: The residential Whole Home offering process begins with an initial in-home assessment by a registered energy advisor. The advisor performs a detailed walk-through of the home to identify all energy saving opportunities, takes the time to explain these to the homeowner along with the benefits of undertaking the upgrades and available rebates, and also generates the renovation upgrade report which outlines the areas of improvement for the homeowner. Enbridge Gas will continue to use this personalized and customized approached towards energy literacy to educate customers.

Energy literacy through marketing: Both traditional and digital marketing tactics for the residential program, including but not limited to, newspaper wraps, direct mails, bill inserts, social media marketing, google advertising, YouTube videos etc., have included and will continue to include information regarding the benefits of energy efficiency, advantages of undertaking home upgrades, as well as simple tips to improve home energy performance. As an example, in 2020, the Enbridge Gas website was enhanced to include energy saving tips for residential homeowners, and educational videos on specific opportunities, such as an insulation 101 and air sealing 101 video. Enbridge Gas will continue to proactively explore and leverage opportunities to include and expand on building energy literacy through its traditional and digital marketing initiatives.

b) A breakdown of incremental resource requirements is included in Exhibit D, Tab 1, Schedule 1, pages 22 to 23.

The associated costs to support further contractor engagement in the residential sector is provided in the response to Exhibit I.6.EGI.VECC.6a in the Whole Home offering Delivery Cost as Delivery Channel Support.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.11

Question(s):

Enbridge Gas describes the offering details for its Residential whole home offering.

a) Please discuss the steps Enbridge Gas takes to ensure that the registered Energy Advisors delivering the offering use the NRCan energy modelling software as instructed by NRCan, including the proper use of all variables and consistent, accurate user inputs.

b) Please discuss if customer will be offered the ability to install a heat pump (either electric or gas) as part of this program. If not, please discuss the rationale for the decision to disallow heat pumps.

c) Please discuss if eligible customers may also participate in the NRCan Greener Homes program and the CMHC program. In your response, please discuss how Enbridge Gas proposes its program interact with these other programs from a customer standpoint.

d) Please confirm that no measures will be offered as direct install measures as part of the Whole Home offering.

e) The proposed offering includes an assessment incentive of $550 for home owners that complete the pre- and post-project energy audits. What portion of the total assessment cost, on average, is paid by the offering?

f) Please discuss if the offering addresses any pre-weatherization barriers such as health and safety measures. a. If so, please describe the eligible measures and what portion of the cost of such measures is paid by the offering.

g) Please discuss if there is a process that can be used by renters/landlords to participate in this offering.

h) Please discuss how multi-family common areas are treated in this program, if at all. If not, please discuss if/how they are treated in any other offering.

Response

a) Enbridge Gas does not ensure that Registered Energy Advisors delivering the offering use NRCan modelling software as instructed by NRCan. This as a practical matter cannot be done as it would require the devotion of substantial time and effort by internal resources to monitor and verify the protocols/standards used by the numerous Energy Advisors that are involved in relevant program offerings.

   It should be noted that the Whole Home modelling is completed by Registered Energy Advisors affiliated with NRCan-licensed Service Organizations, with the expectation that NRCan protocols/standards are being followed given that this is a licensing requirement. Failure to follow these protocols/standards could result in suspension or loss of license by NRCan, which would in turn render Energy Advisors ineligible to participate in Enbridge Gas's program.

b) Gas and electric heat pumps have not been included as eligible measures within the Residential resource acquisitions offerings. The rationale is that these technologies face too many market barriers and require support beyond what is typical of a resource acquisition program. Furthermore, gas heat pumps are still working towards being market ready. Enbridge Gas believes it is more appropriate that these technologies are delivered in the Low Carbon Transition program, with the intent of transitioning these measures to resource acquisition offerings when and if appropriate, please see response to Exhibit I.10.EGI.ED.35d for further explanation.

c) Please see response to Exhibit I.10a.EGI.STAFF.31.

d) Confirmed. No measures are installed directly by Registered Energy Advisors at the time of the assessment(s).

e) Beginning June 3, 2021, Enbridge Gas increased the rebate for the pre and post assessments to match the Greener Homes Canada Grant program rebate of $600. In Ontario, the cost for assessments varies between $600 + HST and $750 + HST (inclusive of the pre and post assessments). Most Service Organization's charge $600 + HST, so in most cases the rebate covers 100% of the cost of the assessment.

f) The Whole Home offering does not address any pre-weatherization barriers such as health and safety measures.

g) Confirmed. The offer is open to tenanted properties, and they follow the same process as owner occupied properties.

h) Multi-family buildings are outside the scope of the Whole Home offering. Multi-family buildings are within the scope of commercial and low-income offerings. The Affordable Housing Multi-Residential offer targets Private and Social housing providers with Custom, Prescriptive and Direct Install measures addressing space heating, water heating and ventilation. In the Commercial program, Multi-family (Multi-residential) buildings are eligible within the Custom offering as well as the Prescriptive Downstream, Prescriptive Midstream and Direct Install for select measures as outlined in the OEB Technical Reference Manual,[1] where the equipment meets requirements of the substantiation documents for space heating, water heating and ventilation measures. Common areas are not directly targeted by these offerings however these common areas can be improved via eligible measures within these offerings.

[1] OEB Natural Gas Demand Side Management Technical Resource Manual, Version 5.0 (November 12, 2020). https://www.oeb.ca/sites/default/files/OEB-Natural-Gas-DSM-TRM-V5.0-20201112.pdf

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.12

Question(s):

Enbridge Gas outlines the available incentives/enables available to customers participating the whole home offering.

a) Please provide specific protocols Enbridge Gas takes to ensure that contractors are documenting all events at a homeowner's residence accurately. In your response, please discuss how various inputs, including documentation of the installation of insulation, are verified by Enbridge Gas.

b) Please provide a table that compares all the measures and levels of incentives offered as part of the new program to the incentives offered in the legacy EGD and legacy UG offerings. Please also include the total incentive amounts issued by Enbridge Gas for each measure since 2015 as well as the average incentive amount per customer since 2015.

c) Please discuss how Enbridge Gas chose the proposed incentive levels, including the proposed bonus incentives for installing more than two measures.

Response

a) Measure installs are verified by Registered Energy Advisors, who follow NRCan protocols to confirm measures were installed during the post assessment. Please see response to Exhibit I.10a.EGI.STAFF.33a for additional detail.

b) In early years, tracking of all costs were done centrally with other residential offerings so Whole Home specific data is unavailable. The metric achievement along with reported financial incentives have been used to calculate average incentive per customer. Due to variances in that account along with the differences that may occur in actual participants in a year, compared to reported metric

achievement, this is meant to be a reasonable estimate. Incentives are properly calculated and tracked for the whole home amount to be paid to customers and not measure by measure. These are being provided on a best-efforts basis but will not fully align with incentives reported for a variety of reasons, especially since it doesn't include all eligible incentives such as energy audits and bonuses/limited time offers.

The chart below provides the average incentive payment per customer from 2015-2020.

	2015	2016	2017	2018	2019	2020
EGD	$1,477	$1,484	$1,487	$1,510	$1,684	$1,823
UG	$1,543	$1,273	$1,419	$1,471	$1,798	$2,058

Please see Attachment 1 for a table comparing the measure incentives for the Whole Home offering since 2015, as well as tables which outline the total incentive amounts issued by Enbridge Gas for each measure since 2016. For 2015, EGD incentive payments were tiered based on the participant's whole home performance and Union only tracked the whole home incentive amount to be paid to customers, not measure by measure.

c) The proposed incentive levels, including the proposed bonus incentives for installing more than two measures, are based on the existing incentive levels in the Whole Home offering at the time of the Plan filing. Incentives reflect the experience Enbridge Gas has had in delivery of the Whole Home offering. Generally, measure incentives are informed by the incremental costs of the measure, alongside consultation with the market and professional judgment on what incentive level will drive adoption. The average incentive as a percentage of incremental cost is provided in Exhibit I.10a.EGI.EP.14d. The multi-measure bonus incentive levels are designed to encourage homeowners to pursue all energy savings available to them.

Whole Home Measure Categories & Criteria	2015		2016			2017			2018				2019	2020		2021+	
	L-EGD	L-UG	L-EGD	L-UG		L-EGD	L-UG		L-EGD		L-UG		L-EGD & L-UG	L-EGD & L-UG		L-EGD & L-UG	
				GIF Included*		IESO Whole Home Included**		IESO Whole Home Included**			GIF Included* IESO Whole Home Included**			To Sept 20	On/After Sept 20	To June 3 & as filed for 2023+	On/After June 3
Energy Audit																	
EnerGuide Assessments	Included in Whole Home incentive	$500	Included in Whole Home incentive	$500	$500	Included in Whole Home incentive	$500	$600	$600	$550	$600	$550	$550	$550	$550	$550	$600
Attic/Cathedral Insulation																	
Increase attic insulation from R-35 or less to at least R-60.							N/A							$500	$650	$650	$750
Increasing attic insulation to at least R50 from R12 or less		$500		$500	$500		$500	$500	$500	$500	$500	$500	$500	N/A	N/A	N/A	N/A
Increasing attic insulation to at least R50 from R13 to R25	N/A	$250	N/A	$250	$250	N/A	$250	$250	$250	$250	$250	$250	$250				
Increase cathedral/flat roof insulation by at least R14		$500		$500	$500		$500	$500	$500	$500	$500	$500	$500	$500	$650	$650	$650
Exterior Wall Insulation																	
Add at least R20 to 100% of building		N/A		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	$2,000	$2,000	$3,000	$3,000	$3,000
Add at least R-9 to 100% of building to achieve a minimum of R-12	N/A	$1,500	N/A	$1,500	$1,750	N/A	$1,750	$1,750	$1,750	$1,500	$1,750	$1,500	$1,500	$1,500	$1,750	$1,750	$1,750
Add at least R-3.8 to 100% of building to achieve a minimum of R-12.		$1,000		$1,000	$1,250		$1,250	$1,250	$1,250	$1,000	$1,250	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Basement Insulation																	
Add at least R-23 to 100% of basement wall.		$1,000		$1,000	$1,250		$1,250	$1,250	$1,250	$1,000	$1,250	$1,000	$1,000	$1,000	$1,250	$1,250	$1,250
Add at least R-12 to 100% of basement wall.		$500		$500	$750		$750	$750	$750	$500	$750	$500	$500	$500	$750	$750	$750
For adding at least R-23 to 100% of crawl space wall.		$800		$800	$1,000		$1,000	$1,000	$1,000	$800	$1,000	$800	$800	$800	$1,000	$1,000	$1,000
Adding at least R10 to 100% of crawl space wall	N/A	$400	N/A	$400	$500	N/A	$500	$500	$500	$400	$500	$400	$400	$400	N/A	N/A	N/A
For adding at least R-12 to 100% of crawl space wall.		N/A		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$500	$500	$500
Adding at least R24 to 100% floor above crawl space		$450		$450	$500		$500	$500	$500	$450	$500	$450	$450	$450	N/A	N/A	N/A
Adding at least R32 to 100% floor above crawl space		N/A		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$1,000	$1,000	$1,000
Furnace/Boiler																	
Replace a 94% or less AFUE with a 95% or higher AFUE natural gas, propane, or oil furnace. OR Replace an 89% or less AFUE with a 90% or higher AFUE natural gas, propane, or oil boiler.		N/A	N/A	$500	$1,000	N/A	$1,000	$1,000	$1,000	$750	$1,000	$750	$750	N/A			
Replacing a low or mid-efficiency heating system with 95% AFUE or higher condensing natural gas furnace OR 90% AFUE or higher ENERGY STAR® condensing gas boiler	N/A	$500	N/A											N/A			
For replacing a less than 96% AFUE natural gas furnace with a 96% AFUE or higher condensing natural gas furnace		N/A												$500	$250	$250	$250
For replacing a less than 90% AFUE natural gas boiler with a 90% AFUE or higher condensing natural gas boiler.		N/A												$1,000	$1,000	$1,000	$1,000
Water Heater																	
Replacing a water heater with an ENERGY STAR and ecoENERGY-qualified instantaneous natural gas water heater with EF of 0.82 or higher	N/A	$200	N/A	$200	$500	N/A	$500	$500	$500	$200	$500	$200	N/A				
Replace existing natural gas water heater with 0.80 EF or higher tanked ENERGY STAR® qualified natural gas water heater. OR Replace existing natural gas water heater with 0.90 EF or higher tankless ENERGY STAR® qualified natural gas water heater.	N/A												$200	$200	$400	$400	N/A
Replace existing natural gas water heater with ENERGY STAR® certified natural gas 0.77 EF/0.80 UEF or higher tank type water heater or 0.87 UEF or higher tankless water heater													N/A				$400
Window, Door																	
Install ENERGY STAR® qualified window, door, skylight	N/A	$40	N/A	$40	$80	N/A	$80	$80	$80	$40	$80	$40	$40	$40	$40	$40	$40
Air Sealing																	
Target	N/A	$100	N/A	$100	$100	N/A	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Target + 10%		$150		$150	$150		$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
Multi Measure Bonus																	
3 Measures	N/A		N/A	$250	$250	N/A	$250	$250	N/A	$250	$250	$250	$250	$250	$150	$150	$150
4 Measures				$500	$500		$500	$500		$500	$500	$500	$500	$500	$500	$500	$500
5+ Measures				$750	$750		$750	$750		$750	$750	$750	$750	$750	$750	$750	$750
Insulate 100% of basement				N/A			N/A			N/A			N/A	N/A	$500	$500	$500
Limited Time Offer																	
Replace furnace/boiler, Attic, Achieve Air Sealing Target or Target +10%****							N/A						$1,750	$1,600	N/A	N/A	N/A
Attic, Air Sealing Target or Target +10%****													$750	$850			
Whole Home Incentive based on % savings																	
Achieve at least 15% annual gas savings	N/A	N/A	N/A	N/A	N/A	$2,100***	N/A	N/A	N/A								
Achieve 15%-24% annual gas savings			$1,000														
Achieve 24%-49% annual gas savings	$1,600		$1,600			N/A											
Achieve 50%+ annual gas savings	$2,000		$2,100														

*Enhanced Green Investment Fund Launched Q3 2016, concluded October 31, 2018
** IESO Whole Home offering launched in Q2 2017, concluded September 30, 2018
***Effective May 29, 2017
****Bonus of $200 or $250 depending on the Air Sealing Achievement

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.13

Question(s):

Enbridge Gas notes it is conducted a pilot on virtual audits.

a) Please provide more information on the virtual audit pilot, including the number of virtual audits included in the pilot, the general makeup of the customers selected to participate, the technology used for the virtual audit and if it is owned by Enbridge Gas, preliminary responses from customers.

Response

a) The intent of the Virtual Audit pilot is to test the capabilities of virtual audit technologies, specifically the accuracy level of this technology compared with traditional in-person audits. Enbridge Gas has selected two vendors for the pilot and is testing their virtual audit solutions. To complete this testing, Enbridge Gas has provided the vendors with limited home attribute data from 2,000 past Whole Home participants. This data will be used to generate a "virtual audit", which Enbridge Gas intends to compare with results of in-person audits. This work is currently in progress and is expected to be completed by Q2 2022. The cost of the pilot is anticipated to be $84,000. The technology used in the pilot is not owned by Enbridge Gas. No customers have been engaged in the pilot, so Enbridge Gas does not have any responses from customers to share.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.13

Question(s):

Enbridge Gas notes it is still conducting research to inform the substantiation documents for the three insulation measures included in the proposed single measure offering.

a) Please provide an update of the status of Enbridge Gas's research, including any draft substantiation documents.

b) If not complete, please discuss the timeline to complete this research.

c) Please provide more information on how the estimates included in the proposed single measure offering were developed.

Response

a) Project is ongoing, no draft measure substantiation documents have been completed to date.

b) Project is anticipated to be complete in the 3rd quarter of 2022.

c) To determine the Single Measure m3 savings values included as it relates to Attic, Wall and Basement Insulation within the plan, Enbridge Gas initially considered utilizing values included within the APS but was not comfortable with the values presented as was indicated in Exhibit E, Tab 4, Schedule 7, page 1. As a result, Enbridge Gas undertook an approach that leveraged data from previous participants of the Whole Home Program to come up with conservative estimates to use as placeholders with the knowledge we will move to TRM accepted values once research has been completed.

Enbridge Gas acknowledges that these values were not developed with the rigour and detail that it would normally expect from a TRM driven approach, but they were intended to be used as a placeholder only until the TRM research is concluded.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.17

Question(s):

Enbridge Gas notes it is still in the process of developing a custom calculator to estimate energy savings from professional air sealing installations.

a) Please provide an update of the status of Enbridge Gas's development of the custom calculator, including the anticipated completion date.

b) Please discuss the incremental costs for customers assuming customer incentive is $450.

Response

a) A custom energy savings calculator is being developed as part the Professional Air Sealing Pilot. The completion of the pilot was delayed due to COVID-19, however, Enbridge Gas anticipates the pilot (and calculator) will be completed in Q2 2022.

b) The incremental cost assumed is $625, which is based on early participant data from the Professional Air Sealing Pilot. This value was intended to be used as a placeholder as the Air Sealing Pilot is ongoing. As the pilot continues, Enbridge Gas will look to update this value based on data collected through the pilot.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.19

Question(s):

Enbridge Gas notes it will explore process evaluation topics throughout the term of the plan.

a) Please discuss if Enbridge Gas will conduct a process evaluation early in the proposed single measure offering delivery. If not, how will Enbridge Gas ensure that the program is being delivered in the intended manner and are achieving the stated objectives and goals?

Response

a) For new offerings being released to market in their first year, Enbridge Gas generally does support the idea of implementing either a formal process evaluation, or informal fast feedback survey to help inform the performance and areas for improvement.

   As per Exhibit E, Tab 4, Schedule 1, pages 9-10, “While Enbridge Gas will ultimately be responsible for overseeing all aspects of the Process Evaluation studies, it commits to take into consideration feedback received from the EAC and EC concerning final scopes of work and deliverables prior to securing a third-party delivery agent and executing each evaluation.”

   Regarding process evaluation for these new offerings specifically, Enbridge Gas will be better positioned to assess and communicate its process evaluation priorities following OEB approval of the Application.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, p.12

Question(s):

Enbridge Gas notes that customers participating in the Smart Home offering will receive a $75 rebate toward the purchase of a smart thermostat.

a) Please discuss if customers will be able to choose other smart technologies through the offering that impact electricity usage.

b) Please discuss how Enbridge Gas choose the incentive amount of $75.

c) Please discuss if customers that participated in the whole home and/or single measure offer can also participate in the smart home offering.

Response

a) Enbridge Gas will continue to look at opportunities to add new smart home technologies to the offering. These technologies may include electric savings in addition to gas savings. In addition, Enbridge Gas will continue to look for opportunities (where appropriate) to further collaborate with the IESO on the Smart Home offering.

b) Based on market research conducted internally, Enbridge Gas adjusted the Smart Thermostat incentive from $100 to $75 effective January 1st, 2019. This change was in response to the declining price per unit of adaptive thermostats in the marketplace, including the introduction of the Nest E and the Ecobee Lite in 2018.

c) Yes, customers that participated in the Whole Home and/or Single Measure offer can also participate in the Smart Home offering provided they meet the eligibility criteria in Exhibit E Tab 1 Schedule 2, page 21 of 22.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2

Question(s):

The Council is interested in historical costs and participation rates for the residential home audit and retrofit programs undertaken by EGD and Union Gas Limited over the last 10 years. With respect to the previous residential home audit and retrofit programs undertaken by EGD and Union Gas for the period 2011-2021 please provide the following for each year:

a. Total program costs, allocated administration/portfolio costs, shareholder incentive payments, DSMVA (in effect, all costs related to the programs);
b. Projected participation rates and actual participation rates;
c. Average incentive payments per customer;
d. Total incentives paid out by measure;
e. Projected annual natural gas savings and actual natural gas savings achieved.

Response:

Please note that 2011 information is not provided as the home retrofit offerings began in 2012.

For parts a, b, c, and e, see Tables 1 and 2 below.

For part d, refer to Exhibit I.10a.EGI.Staff.34, Attachment 1, page 2. Please note that for 2012 to 2015, EGD incentive payments were tiered based on the participant's whole home performance and Union only tracked the whole home incentive amount to be paid to customers, not measure by measure, therefore the request could not be provided for those years.

Table 1 – EGD Rate Zone (Home Retrofit Offering)

	2012	2013	2014	2015	2016
a) Total HER DSM Costs (all costs except DSMI)	$999,502	$3,829,573	$11,012,115	$12,050,103	$25,409,748
b) HER Participant Target at 100%	160	732	747	762	8,259
b) HER Participant Metric Achieved	209	1,649	5,213	5,646	12,986
c) Average Incentive Payment Per Customer	$1,920	$1,333	$1,454	$1,477	$1,484
e) Actual Net Cumulative Natural Gas Savings (m3)	5,296,300	38,980,521	89,690,562	102,415,214	229,695,730
e) Actual Net Annual Natural Gas Savings (m3)	264,815	1,949,026	5,914,881	6,762,791	14,988,260

	2017	2018	2019	2020 (Draft Audit)	2021 (Forecast) [1]
a) Total HER DSM Costs (all costs except DSMI)	$26,029,067	$26,498,569	$32,788,648	$30,038,838	$32,469,027
b) HER Participant Target at 100%	9,116	9,235	11,606	10,700	10,054
b) HER Participant Metric Achieved	11,390	14,413	16,480	14,013	14,747
c) Average Incentive Payment Per Customer	$1,487	$1,510	$1,684	$1,823	$1,866
e) Actual Net Cumulative Natural Gas Savings (m3)	153,917,853	157,959,135	220,374,038	173,919,345	201,828,961
e) Actual Net Annual Natural Gas Savings (m3)	6,156,714	6,318,365	8,814,962	6,956,774	8,073,158

1. 2021 forecast of results and spend are as detailed in interrogatory response to I.6.EGI.STAFF.13 a, Attachment 1. However, the numbers may vary due to rounding adjustments

Table 2 – Union Rate Zones (Home Retrofit Offering)

	2012	2013	2014	2015	2016
a) Total HER DSM Costs (all costs except DSMI)	N/A	N/A	$2,517,060	$4,816,523	$11,189,498
b) HER Participant Target at 100%	160	160	254	1,245	3,300
b) HER Participant Metric Achieved	73	203	996	2,529	6,595
c) Average Incentive Payment Per Customer	N/A	N/A	$1,746	$1,543	$1,273
e) Actual Net Cumulative Natural Gas Savings (m3)	1,799,370	6,073,437	26,518,351	57,744,701	110,310,927
e) Actual Net Annual Natural Gas Savings (m3)	89,969	303,672	1,342,361	3,189,046	4,412,437

	2017	2018	2019	2020 (Draft Audit)	2021 (Forecast) [2]
a) Total HER DSM Costs (all costs except DSMI)	$24,034,261	$27,216,207	$21,999,996	$17,353,092	$ 17,926,332
b) HER Participant Target at 100%	6,859	8,010	8,308	6,896	6,070
b) HER Participant Metric Achieved	13,729	16,118	10,958	7,619	7,009
c) Average Incentive Payment Per Customer	$1,419	$1,471	$1,798	$2,058	$2,275
e) Actual Net Cumulative Natural Gas Savings (m3)	194,625,102	205,146,928	154,742,128	125,206,865	136,891,442
e) Actual Net Annual Natural Gas Savings (m3)	7,785,004	8,205,877	6,189,685	5,008,275	5,475,658

2. 2021 forecast of results and spend are as detailed in interrogatory response to I.6.EGI.STAFF.13 a, Attachment 1. However, the numbers may vary due to rounding adjustments

Notes:

- For part a
  - Shareholder incentive (DSMI) is not included, as DSMI is determined and reported on a scorecard level rather than a specific offering level.
  - For 2012 and 2013, Union tracked all residential costs together (including the ESK offering), therefore costs specific to the home retrofit offering is not available for those years
  - Administration costs are not tracked at the offering level for all years, as such Enbridge has made best efforts to allocate residential administration costs for the home retrofit offering specifically. Portfolio-level costs have not been allocated to the home retrofit offering.
- For part b
  - Participation rates are based on DSM scorecard metric achievement, and would not include participation that did not meet metric eligibility.
- For part c
  - For 2012 and 2013, Union tracked all residential costs together. Total incentive costs specific to the home retrofit offering is not available for this calculation.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 3

Question(s):

The evidence states that EGI is of the view that allowing flexibility in the design and delivery of the Residential program will best support all stakeholders and allow for coordinate and responsive DSM programming that can adapt with external efforts. Please explain this statement. What type of flexibility is EGI seeking with respect to the Residential program?

Response:

Please see response to Exhibit I.10a.EGI.STAFF.31e.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 3

Question(s):

How does EGI intend to ensure that Whole Home participants will not also be getting funding for the same measures through the Greener Home Grant Program?

Response:

Please see response to Exhibit I.10a.EGI.STAFF.31.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 12

Question(s):

Please explain, in detail, how the incentive amounts for the Whole Home Program determined. Please explain why, as a part of the Whole Home offering bonus incentives are required. What is the rationale for still including furnaces in the program given the changes to the residential furnace baseline?

Response:

Please see response to Exhibit I.10a.EGI.STAFF.34c for an overview of how proposed incentive levels were set, as well as the rationale behind bonus incentives.

While Enbridge Gas recognizes changing standards have had an impact to the savings and cost effectiveness of furnaces, HVAC contractors continue to be an important lead generation source for the Whole Home offering, driving program participation. The goal of the Whole Home offering, which should not be lost, is not the replacement of a furnace but rather the implementation of the other multiple measures (a minimum of two additional energy efficiency measures in cases where a furnace is installed) that the whole home approach is seeking to promote. The furnace, which is the primary point of gas consumption in homes, has importance and visibility to the homeowner and provides an opportunity to promote the value of the home energy assessment and other envelope upgrades in the home. In these cases, the customer's interest in a measure which may on its own not be cost-effective is the key to persuading the customer to install a package of measures that are cost-effective in aggregate. This leads to greater overall benefits through the execution of the building envelope improvements.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 13

Question(s):

For each year 2022-2027 for each of the residential programs please provide the projected number of participants and the average incentive payments forecast per customer.

Response:

Please see below. Note that DSM Plan term is now 2023-2027 as was updated in the evidence filed with the OEB on September 29, 2021.

Residential Offering Name	2023 Participant Forecast	2023 Avg. Incentive	2024 Participant Forecast	2024 Avg. Incentive	2025 Participant Forecast	2025 Avg. Incentive	2026 Participant Forecast	2026 Avg. Incentive	2027 Participant Forecast	2027 Avg. Incentive
Whole Home	14,850	$1,910	15,201	$1,907	15,505	$1,907	15,815	$1,907	16,131	$1,907
Single Measure	6,260	$568	6,408	$566	6,536	$566	6,667	$566	6,800	$566
Smart Home	34,750	$80	35,571	$80	36,282	$80	37,008	$80	37,748	$80

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 13

Question(s):

Will participants in the Whole Home offering also be eligible for the Smart Home offering? Will participants in the Single Measure program also be eligible for the Smart Home Offering?

Response:

Confirmed.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 13

Question(s):

As part of the Whole Home offering participants receive $550 for completing the pre and post energy audits. What is the total cost of the audit?

Response:

Please see response to Exhibit I.10a.EGI.STAFF.33e.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Question(s):

As part of the Single Measure offering no energy audit is required. How will EGI ensure that the measure was actually installed? What type of arrangements will EGI have with participating contractors?

Response:

As a program requirement, Enbridge Gas will require contractors and customers to submit supporting documentation (which could include invoices, pictures etc.) to confirm eligible measures have been installed. This documentation will be submitted to Enbridge Gas via self-service tools and will be required before incentives are paid out. Enbridge Gas will look to engage contractors to participate in the offering via a contractor network. Please see Exhibit E, Tab 1, Schedule 2, page 18 of 22.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, pages 2 and 22

Question(s):

The evidence states that EGI is exploring efforts to support moderate income customers in coordination with the IESO by way of providing increased support with some residential programming. This is part of the Smart Home offering. Is EGI paying for the full cost of this offering or will the costs be shared with the IESO? How will the attribution of savings be dealt with?

Response:

Please see response to Exhibit I.10a.EGI.STAFF.30.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2

Question(s):

Did EGI consider implementing any other residential programs? If so, what are those programs and why were they rejected. If not, why not?

Response:

Please see response at Exhibit I.10.EGI.OSEA.3a and b.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2

Question(s):

Please provide the cost-effective screening results for each of the residential offerings – Whole Home, Single Measure and Smart Home.

Response:

The forecast TRC-Plus values for each of requested offerings are provided in evidence at Exhibit D, Tab 1, Schedule 4, page 2.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2

Question(s):

Please provide EGI's projected commodity cost forecast for the Plan Term (2022-2027) which was used in the development of the plan. What would be the impact on the residential program offerings if commodity costs were to increase at levels which exceed the current forecast?

Response:

Enbridge Gas's avoided natural gas costs used in the Application can be found at Exhibit E, Tab 5, Schedule 1, pages 2 and 4 (EGD rate zone and Union rate zones, respectively). For the avoided gas commodity and upstream transmission/storage costs specifically, refer to:

- "SENDOUT Report" tab in Exhibit I.5.EGI.ED.16 Attachment 1 for the EGD rate zone
- "SENDOUT Report" tab in Exhibit I.5.EGI.ED.16 Attachment 2 for the Union rate zones

As per Exhibit E, Tab 5, Schedule 1, page 4: "Enbridge Gas will update its avoided costs each year and report DSM results based on the avoided costs for that year." Should natural gas commodity costs increase through these updates, it would result in a higher TRC-Plus result for residential programs in those years.

An increase in commodity costs could result in additional measures becoming cost effective, however, Enbridge Gas cannot commit to more detail in this area, as Enbridge Gas would need to assess the impact of increased commodity costs if and when they exceed the current forecast. Other factors that would need to be considered include the market availability of measures and the budget available for the Residential Sector.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Energy Probe Research Foundation (EP)

Interrogatory

Issue 10a

Reference:

Exhibit D Tab 1 Schedule 3Page 4 Table 2

Question(s):

a) For the Residential RA Programs please provide a schedule that shows the targets and achievement for 2017-2019 legacy and merged 2020-21 DSM Programs (unaudited).Include the DSMI amounts earned in each year.

b) Specifically show how COVID-19 has affected participation rates and delivery in 2020/2021 for each program and # measures implemented

c) For 2023 please provide the % change in targets to historical average and historical minimum to maximum achievement. Provide with and without 2020/2021 data

d) For 2023 has EGI increased # Residential Programs/measures? (please specify)

e) For 2023 has EGI increased/reduced customer incentives? Please specify

Response:

a) Please see the response to Exhibit I.5.EGI.FRPO.4. Note that OEB DSM targets are not necessarily set individually by program (i.e. for the residential RA program specifically). In some cases, one target can include multiple programs. Enbridge Gas has provided target, achievement and DSMI amounts earned based on the OEB approved scorecard/target structure.

b) Although the Company appreciates interest in understanding the impacts of the pandemic on the DSM portfolio at a detailed level, Enbridge Gas is unable to disaggregate the various impacts of the shutdowns, partial shutdowns and policy restrictions imposed in an on-again off-again fashion during 2020/2021 with any level of accuracy that could be considered useful to Interested Parties or the OEB. Any attempt to disaggregate this would be time intensive and laden with

assumptions and the Company does not believe this would be relevant to the DSM Plan proposed for 2023-2027.

c) For historical achievement separated by scorecard, please see the response to Exhibit I.5.EGI.FRPO.4. For the combined historical results please see the response to Exhibit I.5.EGI.GEC.6. As there has been significant changes to the proposed residential programs in 2023, most notable the addition of the residential single measure offering, Enbridge Gas does not believe it is appropriate to directly compare the historical results to the proposed 2023 targets.

d) Yes. The new Single Measure offering aims to encourage broader participation in the Residential program. Please see Exhibit E, Tab 1, Schedule 2, page 15 for offer details. In addition, a moderate income stream has been added to the Smart Home offering through a collaboration with the IESO. Please see Exhibit E, Tab 1, Schedule 2, page 22 for details.

e) The Smart Home offering has been enhanced through collaboration with the IESO to offer an enhanced incentive on Smart Thermostats for moderate income customers. Please see Exhibit E, Tab 1, Schedule 2, page 22 for details. The standard income Smart Home incentive remains unchanged. Measure incentives for the Whole Home offering remain unchanged from the offer at the time of the Plan, however effective June 3, 2021 the Audit incentive was increased to $600, and the Attic Insulation incentive for R-35 or less to at least R-60 was increased to $750.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Energy Probe Research Foundation (EP)

Interrogatory

Issue 10a

Reference:

Exhibit E Tab 1Schedule 2 Page 12 Table 1

Question(s):

a) Confirm the Ontario Building Code now requires R60 attic insulation, so any homeowner undertaking renovations under a Municipal Building permit must install added insulation to R 60 How does EGI make the incentive appropriate for these circumstances?

b) For each of the listed retrofit measures, please provide the calculations that underpin the incentive, list input assumptions for example area of wall insulation type/thickness R value and Output measure e.g. m3 savings.

c) Provide the Estimated customer cost to complete each measure.

d) For each measure List the incentive % based on Cost to customer and M3 gas saved per year and total m3 over life of measure.

e) For Air Sealing. What is the historic range of improvement, without adding any exterior insulation (such as Silverboard). Is there a correlation with the age and size of the house?

f) Is the amount listed in para 53 (average participant incentive of approximately $450 per home or $2.25/m3 saved) based on historic data or modelling? Please discuss.

Response:

a) The Whole Home offering is a program that offers incentive for participants to go above the requirements of the Ontario Building Code ("OBC"). Enbridge Gas can confirm, in reference to New Construction, the OBC offers different paths of compliance for which R60 attic insulation is one of the choices.

b) Please see response to Exhibit I.10.EGI.ED 22b.

c -d)

Enbridge Gas utilizes Net Equipment costs as required for cost-effectiveness screening as described in Exhibit C, Tab 1, Schedule 1, page 40, and does not gather full customer project costs for the Whole Home offering. The chart below provides the 2020 average net equipment costs and average incentive costs at the measure and whole home level for the most recent program year as the averages for most upgrades are based on the details of the upgrades completed. A comparison of the incentive as a percentage of these costs has also been provided. The rebates in Exhibit E, Tab 1, Schedule 2, page 12, Table 1 are consistent with the rebates established for participants entering the program offering on/after September 20, 2020 and at the time of the Plan filing. As of that date rebates were enhanced for insulation upgrades (varies by upgrade) and the water heater (to $400) and decreased for the furnace (to $250) and 3 measure bonus (to $150). Please see Exhibit I.10a.EGI.STAFF.34 b Attachment 1 for a full comparison of the 2020 rebates with the rebates in Exhibit E, Tab 1, Schedule 2, page 12, Table 1.
It is important to note, the Whole Home offering is a is a whole home performance program. The goal is not the replacement of single measures, but rather the implementation of multiple (a minimum of two, or three where a furnace is replaced) energy conservation measures via participation in the offering.

The annual and lifetime natural gas savings for each measure are not provided as the offering uses NRCan's HOT2000 software to calculate the whole home savings (including interactive effects) across all measures.

	Attic Insulation	Basement Insulation	Exterior Wall Insulation	Air Sealing	Furnace	Boiler	Water Heater	Window/ Door/ Skylight	Whole Home*
2020 Avg. Measure Incentive	$494	$560	$1,267	$109	$673	$843	$205	$251	$1,906
2020 Net Equipment Cost	$796	$1,267	$2,354	$197	$517	$1,180	$3,233	$3,916	$3,027
Incentive as a % of Avg. Net Equipment Cost	62%	44%	54%	55%	130%	71%	6%	6%	63%

* Whole Home 2020 Avg. Measure Incentive includes all bonuses and rebate for the pre- and post-retrofit energy assessments. Whole Home 2020 Net Equipment Cost includes the cost of the pre- and post-retrofit energy assessments.

e) The chart below demonstrates the range of air sealing improvements for 2020 participants of the Whole Home offering who did not install an insulation measure as part of the offering. There is some correlation between the range of improvement and age/size of home.

Air Sealing % Over Target Achievement	Average Age	Average Sq Ft
Target	45	2,558
Target + 5% to less than 10%	44	2,299
Target + 10% to less than 15%	49	2,101
Target + 15%+ or greater	48	2,074

f) These values are based on early data from the Professional Air Sealing Pilot Enbridge Gas is delivering. These values are intended to be used as a placeholder as the Air Sealing Pilot is ongoing. As the pilot continues, Enbridge Gas will look to update this value based on data collected through the pilot.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Energy Probe Research Foundation (EP)

Interrogatory

Issue 10a

Reference:

Exhibit E Tab 1Schedule 2 Page 12 Table 1

Question(s):

a) How much of Ontario housing stock is detached homes, semi-detached homes, row house, townhouse? Show estimates for pre ’60, 70-2000 and post 2000.

b) How many in each Vintage, are Owned and Rented/leased?

c) How much of the stock has <R3.8 exterior wall insulation?

d) If EGI was to upgrade the <R3.8 exterior wall housing stock how many units would be involved?

e) What would be the cost /unit to reach R12?

f) Does the Exterior Wall Insulation incentive include any sharing of the cost of the installation of new wall finish such as Stucco/Siding? Please Discuss.

g) Has EGI or EGI and/or Ministry of Energy discussed an Ontario “House Wrap/Blanket” exterior insulation Program with the Federal Government under the Greener Homes Initiative? If not, why not?

Response:

a) Ontario Housing stock comprises of approximately 5.5 million Residential properties/units. The breakdown of single-family specific types referred to is as below:

House Type	#*	%	Pre-1970 %	1970-2000 %	Post-2000 %	Total
Detached homes	3,170,000	58%	41%	38%	21%	100%
Semi-detached homes	360,000	7%	33%	40%	28%	100%
Row/Townhouse	510,000	9%	12%	47%	40%	99%**
Others***	1,460,000	27%	*Not Applicable*			
Total	**5,500,000**	**100%**				

Source: MPAC (Jan 2021)

* Numbers have been rounded to the nearest ten-thousand (10,000)

** Vintage was not available for all properties; hence the total may not add up to 100%

*** Others include Apartment/Condominium units, Duplexes, Tri/Four/Five/Six-plexes, Mobile Homes

b) Enbridge Gas does not have information on breakdown of Owned vs. Rented by vintage for customers. For Ontario, the high-level numbers are as below:

Owned	69.33%
Rented	30.49%
Band Housing	0.19%

Source: Environics 2021 (based on StatsCanada 2016 Census)

c) Please see response to Exhibit I.10.EGI.ED.22o.Exterior wall insulation is categorized as well insulated, adequately insulated, poorly insulated or not insulated based on the customer's response.

d) Please see response to Exhibit I.10.EGI.ED.22o.

e) Enbridge Gas does not gather full customer project costs. Please see response to Exhibit I.10a.EGI.EP.14c and d for Net Equipment Costs for exterior wall insulation.

f) The exterior wall insulation incentive includes the cost of the additional insulation, the installation cost is assumed to be included in the base case.

g) Enbridge Gas has not had any discussions with the Federal or Provincial Government on an Ontario "House Wrap/Blanket" exterior insulation Program. Enbridge Gas is not aware of a "House Wrap/Blanket" exterior insulation program and is concentrating on how to coordinate existing programing as described in the response to Exhibit I.10a.EGI.STAFF.31.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 1, page 1

Question(s):

Enbridge Gas's proposed Residential program builds on the successes and learnings of the existing Residential program, while incorporating new offerings and elements.

Please summarize the key successes in the Residential program to date.

Response:

Key successes in the residential program to date include:

Strong participation

Overall, the offerings continue to drive results in the residential sector, and participation has been strong. Enbridge Gas has built an effective relationship with program delivery agents, including Service Organizations and Registered Energy Advisors.

Alignment of program offerings

Following the amalgamation of the two utilities January 1, 2019, the customer-facing portions of the Whole Home offerings were aligned (known as Home Efficiency Rebate ("HER") across the franchise) to deliver a consistent program offering to the market. The Smart Thermostat offering was also aligned. While the scorecards and metrics for each legacy utility remained separate this change allowed consistent marketing of the offerings across the province. The harmonization of creative development and promotional elements resulted in realized cost efficiency, that in turn has been utilized to increase reach and penetration of program promotion. Alignment also provided consistency in delivery, including with Service Organizations, Registered Energy Advisors, contractors and retailers.

Collaboration with third parties to deliver enhanced programs

Enbridge Gas has collaborated with Ontario's Ministry of Energy, the IESO, and LDCs to enhance program offerings. These partnerships attracted homeowners that would otherwise not be eligible as well as participants who were new to participating in energy conservation programs in general. Feedback from homeowners indicated that they enjoyed the ease of having a single point of contact to access all the sources of home incentives. Additional detail on these collaborations can be found in the response to Exhibit I.1.EGI.ED.4a.

Shift in Whole Home measure mix

The Whole Home offering continues to drive deep savings for participants, and a key priority of the offering is to continue to ensure the offer takes a holistic-approach to identify and target all energy savings opportunities throughout a customer's home during the pre-assessment. Enbridge Gas has been shifting focus toward the homeowner's consideration of thermal envelope improvements, with the uptake of thermal envelope measures now surpassing the uptake of mechanical measures. The thermal envelope features of a home, however, typically do not fail, and are in fact out of sight, and out of mind. It is therefore more challenging to target customers who will prioritize improving the thermal envelope of their home.

Smart Thermostat offering design

In July 2019 the design of the Smart Thermostat offering changed from a post-purchase rebate to an instant rebate. This made the incentive available in-store at the time of purchase as well as online. This change was made to modernize and enhance the participation experience, to increase participation, and remove barriers created by the previous post purchase rebate model. In addition, Enbridge Gas has continued to evolve the offering through adding channels for customers to purchase thermostats through the offering and qualifying devices.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 1

Question(s):

The residential sector is comprised of more than 3,400,000 accounts that collectively consume over 8.6 billion cubic meters of natural gas per annum and this segment also includes low income residential customers.

Please provide the data for the low income sector.

Response:

Enbridge Gas does not have an absolute way of identifying Low Income customers in the source system, however estimates can be derived from Environics data, which uses StatsCan 2016 Census data as a base.

Based on this, Enbridge Gas estimates that the low income residential sector is comprised of approximately 404,000 accounts that collectively consume 929 million cubic meters of natural gas per annum.

Please see the response to Exhibit I.10b.EGI.VECC.24 for details on these estimates.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 5

Question(s):

Enbridge Gas indicates that it intends to address the market awareness barrier by broadening and enhancing relationships with contractors and other delivery partners, including an increased focus on those supporting thermal envelope upgrades. By improving contractor awareness of the offering, they will, in turn, be able to inform their clients of the program and address upfront barriers at the opportune time for customer participation, during renovations.

a) Please identify the other delivery partners.

b) Does Enbridge Gas set targets for increased market awareness? If yes, please provide for the Residential program.

Response:

a) Other delivery partners include industry associations, contractors, Service Organizations, and other parties interested in delivering professional air sealing.

b) No, Enbridge Gas does not set targets for increased market awareness. Enbridge Gas continuously measures awareness of the Residential Program offerings through the Residential Natural Gas End Use Survey and digital website metrics. These metrics and measurement allow Enbridge Gas to continually optimize the performance of campaigns and ensure the marketing spend is efficient year on year.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2

Question(s):

Please complete the following table.

Residential Offering Name	2015 Participants (Actual)	2020 Participants (Actual)	2023 Participants (Forecast)	2027 Participants (Forecast)	2023 Average Participant Incentive Assumption ($)	2023 Average Participant NG Savings Assumption (m3)
Whole Home						
Single Measure						
Smart Home						

Response:

Please see table below:

Residential Offering Name	2015 Participants (Actual)*	2020 Participants (Actual)*	2023 Participants (Forecast)	2027 Participants (Forecast)	2023 Average Participant Incentive Assumption ($)	2023 Average **Net** Participant NG Savings Assumption (m3)
Whole Home	8,175	21,632	14,850	16,131	$1,910	7,759,125
Single Measure	0**	0**	6,260	6,800	$568	826,549
Smart Home	0**	30,140	34,750	37,748	$80	6,171,600

*Whole Home specific targets have been provided along with verified metric achievement for actual/forecast participation rates. Actual participation rates may be higher since some homes were not eligible to be claimed for the participant metric but the savings from those homes would be included in the m^3 savings achieved.

**The Smart Thermostat offering launched in 2016 for Legacy Enbridge Gas Distribution, and 2019 for Legacy Union Gas. Thus, participation for 2015 is not available. The Single Measure offering is new for 2023, thus no historical participation is available.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 12

Question(s):

Measure incentives are provided to participants according to the measure installed. Table 1 provides the proposed measure incentives.

Please compare to the measure incentives previously in place.

Response:
Please see response to Exhibit I.10a.EGI.STAFF.34b.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 13

Question(s):

Enbridge Gas is currently conducting a pilot on virtual audits to determine its viability as a future offering enhancement.
Please provide the scope, timeframe and cost of the pilot.

Response:

Please see response to Exhibit I.10a.EGI.STAFF.35a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 18

Question(s):

Participating contractor responsibilities will include identifying candidates as well as submitting program applications and supporting documentation. Customers will be required to sign an agreement confirming that work has been completed as appropriate before an incentive is paid out as a condition of the offering.
Please provide a copy of the program application and supporting documentation, and the customer agreement.

Response:

The Single Measure offering is a new program. Program documentation has not been developed.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10a

Reference:

Exhibit E, Tab 1, Schedule 2, page 22

Question(s):

With respect to the Smart Home offering, eligible participants will receive a $75 incentive towards the purchase of a qualifying smart control device. For participants who qualify as moderate income as part of the collaboration with the IESO, an additional incentive of $50 (for a maximum total incentive of $125) will be provided. Please compare to the measure incentives previously in place.

Response:

Please see the chart below for the historical Smart Thermostat incentives.

	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Smart Thermostat Incentive (EGD)	$100	$100	$100	$75	$75	$75
Smart Thermostat Incentive (UG)				$75	$75	$75
Moderate Income Smart Thermostat Incentive (EGD/UG)						$125

Note: The Smart Thermostat offering launched in 2019 for Legacy Union Gas. Thus, no DSM incentive was available from 2016-2018. Enbridge Gas anticipates the Moderate Income offer will launch in Q4 2021, thus no incentive has previously been in place.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10b

Reference:

Exhibit E, Tab 1, Schedule 3, p.6

Question(s):

Enbridge Gas notes that it's had discussions with the IESO about the possibility of a coordinated delivery of the single-family low-income offerings.

a) Please provide an update of the status of these discussions.

b) If an agreement on a coordinate delivery approach has not been reached, please discuss any challenges and difficulties.

Response

Please see response to Exhibit I.10a.EGI.STAFF.30.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10b

Reference:

Exhibit E, Tab 1, Schedule 3, p.8

Question(s):

Enbridge Gas notes that part of its target market are residents of on-reserve First Nations communities who meet income qualification and eligibility criteria.

a) How many on-reserve First Nations customers does Enbridge Gas currently have?

b) How many on-reserve First Nations customers have participated in either the legacy EGD or legacy UG low-income programs since 2015?

c) How is Enbridge Gas planning on making its program known and accessible to customers of on-reserve First Nations communities? In your response, please discuss Enbridge Gas's marketing strategy, education and awareness plan and if an Energy Advisors will be or have been hired from on-reserve First Nations communities to help provide a trusted source for potential participants.

Response

a) Although there are over 130 Indigenous on-reserve communities within Ontario, there are only 20 Indigenous on-reserve communities in Enbridge Gas's franchise area, 14 of which have residential natural gas service. Therefore, Enbridge Gas currently serves approximately 3,000 residential Indigenous customers on-reserve.

   To date, HWP has been offered to all of the Indigenous on-reserve communities served by Enbridge Gas except two. These two communities were delayed due to COVID restrictions and have now been rescheduled. The two remaining HWP communities Enbridge Gas is working with include Aamjiwnaang First Nation in 2021, and Chippewas of Rama planned for 2022.

While there are other on-reserve communities that have access to natural gas, these communities utilize their own natural gas utility (such as Six Nations of the Grand River), therefore, they are not an Enbridge Gas customer and do not have access to Enbridge Gas's DSM programs.

b) Only Legacy Union Gas had a DSM program dedicated to serving Residential Indigenous customers on-reserve. Legacy Enbridge Gas did not have any Indigenous on-reserve communities in their franchise area.

Though the on-reserve DSM program for Legacy Union Gas was approved in 2015, the first couple years were required for planning, establishing an on-reserve Indigenous Delivery Agent, leveraging Legacy Union Gas' Indigenous Affairs team's existing relationships with Indigenous communities, and further developing knowledge regarding the unique implementation requirement within Indigenous communities.

Over 700 HWP applications have been received from Indigenous on-reserve communities to date. 686 on-reserve homes have received all, or a combination of, Enbridge Gas's basic measures, smoke alarms and carbon monoxide detectors. Only 91 Indigenous homes on-reserve qualified for the HWP insulation measures. Upon review, it was identified that the Indigenous on-reserve housing stock varies significantly across Ontario. Within the Enbridge Gas franchise area, these homes on average, are typically newer (built within the last 30 years) and appear to have insulation levels required by building code. Some of these communities that were built with Insulated Concrete Forms (ICF's), which contained insulation in the middle of the blocks and some homes had insulation upgrades previously either through a private insulation company or as a previously electrically heated home through Hydro One programming.

In order to further learn about the needs of Indigenous on-reserve homes within the Enbridge Gas franchise area, a third-party consultant was hired to learn about the needs of these on-reserve homes and identify potential remaining DSM opportunities. The intention was to visit five of these communities, however, only one community was completed before the COVID-19 Pandemic took effect, and the remaining communities later closed access for this research and temporary participation in HWP. A report was generated, based on the findings of the initial community.

Enbridge Gas is currently working on the internal review of this report, and in discussions with the HWP Indigenous Delivery Agent, to determine any remaining DSM opportunities on-reserve.

The following outlines Enbridge Gas's approach to ensuring program awareness and accessibility to Indigenous on-reserve homes with HWP opportunity.

Obtain endorsement from Chief and Council in accordance with the community's governance structure, which may include a formal process of attending a Chief and Council meeting, to provide a program overview and obtain endorsement (as evidenced by a Band Council Resolution or BCR).

Action items required by the Community, specifically the Chief and Council include:

- Providing a Band Council Resolution endorsing the program
- Appointing a Project Lead and/or beginning any internal hiring processes to find a candidate within the community
- Providing Enbridge Gas with a completed income letter, verifying participating community members meet the income eligibility criteria

After a BCR is obtained, the Indigenous Delivery Agent providing program delivery, First Nations Engineering Services Ltd. (FNESL), launches the program in conjunction with the Project Lead as follows:

- Connecting with community **Project Lead** for training and to setup information sessions.
- Hiring local community members to assist Project Lead as **canvassers**.
- Hosting a **Community Launch Event** to:
  - Educate community members on conservation strategies and program awareness
  - Introducing Project Lead as key contact in the community
  - Intaking of application education and support
- Setting-up scheduling for energy assessment – completing insulation and final assessment within a designated timeframe

c) Enbridge Gas uses a multi-pronged approach to ensuring Indigenous on-reserve communities served by Enbridge Gas are aware of the HWP program and have opportunities to access it.

To start, an Indigenous Project Lead from each community is appointed. The role of the lead is to host information sessions for community members to learn about this program and its benefits. This is a paid role for a community member and has become pivotal to aid in the success of serving on-reserve Indigenous Communities through HWP. Project Leads further support HWP by promoting these programs and encouraging individual homeowners to participate. The Project Lead is identified and trained by Enbridge Gas's Indigenous HWP Delivery Agent, which is also an Indigenous Owned and Operated on-reserve company.

Additionally, community events have been used and are considered pivotal in gaining awareness and acceptance of HWP with in these communities. These information sessions include the local Enbridge Gas's Indigenous Affairs Community Advisor, to leverage existing relationships within the community and have the support from Chief and Council. Enbridge Gas learned early on about the benefit of hosting an in-person community launch to help support positive outreach and understand the offer and its benefits.

To further support the Indigenous Project Lead and the community outreach, Enbridge Gas has developed customized marketing material for on-reserve communities, to highlight the specific process and benefits for Indigenous communities to utilize throughout the process described above.

In the few cases where DSM overlaps with Indigenous electric CDM programming, Enbridge Gas has also collaborated to visit these communities at the same time as other companies, such as meeting with Hydro One in Long Lake 58 First Nation in 2018, and Constance Lake First Nation in 2019. Enbridge Gas has found that communities appreciate the collaboration, where possible.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10b

Reference:

Exhibit E, Tab 1, Schedule 3, p.15

Question(s):

Enbridge Gas lists its target market for the Affordable Housing Multi-Residential offering.

a) Please discuss the process Enbridge Gas will use to identify the multi-residential buildings that have the greatest potential for energy savings. In your response, please indicate what data Enbridge Gas uses when analyzing what customers to approach and what strategies it employs to ensure that program funds are used as effectively as possible.

Response

Enbridge Gas plans to use a variety of approaches to identify multi-residential buildings with the greatest potential for energy savings.

Some of these approaches may include:

- Building potential customer lists using various data sources such as StatsCanada Census, third-party information (e.g. Environics) and internal customer billing classifications etc.
- Enhanced relationships with Low Income stakeholders like Municipalities and CMHC to utilize their market knowledge
  - Review consumption data of buildings and group based on annual usage
  - Identify missed opportunities based on historical information
  - Post-campaign analysis/surveys on marketing and outreach tactics to inform effectiveness of target marketing and most successful marketing strategies.
  - Utilize Affordable Housing Multi-Residential Energy Solutions Advisors (ESAs) to verify eligibility criteria, provide expert advice and work with each customer to discuss their buildings, and identify the best opportunities for cost effective gas savings. Please see Exhibit E, Tab 1, Schedule 3, page 15, paragraph 38i for details on the ESA support for multi-residential buildings.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Housing Services Corporation (HSC)

Interrogatory

Issue 10b

Question(s):

Enbridge Gas is asked to add measures for building envelope improvements to the AHMR program for existing buildings to better serve the program's target customers and achieve greater natural gas savings under the program. Measures should include windows, doors, air sealing, interior insulation, and exterior insulation including cladding and wall assembly systems that increase air tightness.

Response:

Please see Exhibit I.2.EGI.HSC.1

It should be noted that Enbridge Gas's Affordable Housing Multi-Residential program offering includes a custom programming approach. Projects may include a wide variety of measures to drive energy efficiency subject to considerations for cost-effectiveness for the Low Income Program.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Housing Services Corporation (HSC)

Interrogatory

Issue 10b

Question(s):

As noted in Interrogatory # 3.HSC.1, a re-/retro-commissioning offering is missing that would greatly benefit social housing providers. Enbridge is asked to add an offering for re-/retro-commissioning to its AHMR program for existing buildings.

Response:

Please see Exhibit I.2.EGI.HSC.1 and Exhibit I.3.EGI.HSC.2.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Housing Services Corporation (HSC)

Interrogatory

Issue 10b

Question(s):

Enbridge is asked to increase budgets for AHMR and Home Winterproofing to address escalating construction and materials/equipment costs, high inflationary rates, and regional differences that are particularly constraining to low-income consumers including social housing in undertaking energy efficiency projects.

Response:

Please see Exhibit I.2.EGI.HSC.1.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Low-Income Energy Network (LIEN)

Interrogatory

Issue 10b

Question(s):

Regarding Home Winterproofing program at Exhibit E Tab 1 Schedule 3, page 4 of 20:

a) Which specific measures are provided at no cost and which ones at low cost, what is the total estimated cost of each measure and what is the financial contribution by measure that will be required for each of the low-cost measures?

b) What studies were done in the Ontario low-income homeowner market to test and verify both the homeowner's willingness and ability to pay the upfront cost of the low-cost measures? Please provide these studies.

c) For the Enbridge rate zone Home Winterproofing program and the Union rate zone Home Weatherization program, for each year of 2015 to 2021 (best available):
   i. which measures were offered with an upfront financial contribution required by the low-income participant
   ii. what was the financial contribution required by measure
   iii. what was the total cost of the measure, and
   iv. what percent of the total number of low-income participants in each program provided a financial contribution?

d) Has Enbridge set an internal target, budget or made a forecast for either the number or percent of participants forecast to participate broken down by private single family, residents of on-reserve First Nations and social and assisted housing, and if so, what are those targets, budgets and forecasts? If Enbridge has not set such targets or made such forecasts, please explain why not.

Response:

a) Please see response to Exhibit I.5.EGI.LIEN.2b.

b) No studies were completed, as there are no low cost measures being proposed as part of the Home Winterproofing program at this time.

c) Please see response to Exhibit I.5.EGI.LIEN.2b.

d) Enbridge Gas forecasts gas savings based on the historical achievements in this market and factoring in the budget available. Based on the gas savings target that is arrived at, Enbridge Gas can estimate the number of single family homes approximately that would need to participate in the program in that year. Enbridge Gas does not forecast where those homes will come from either by segment or geography.

   Enbridge Gas does not set an internal target, budget or forecast, for either the number or percentage of participants broken down by private single family, resident or on-reserve First Nations, or social and assisted housing as the mix of results across various sub segments changes year over year.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Low-Income Energy Network (LIEN)

Interrogatory

Issue 10b

Question(s):

Regarding Affordable Housing Multi-Residential Offering at Exhibit E Tab 1 Schedule 3, pages 13-20 of 20:

a) Which direct install specific measures are provided at no cost and which at low cost to the customer, what is the total estimated cost of each measure, and what is the financial contribution by measure that will be required for each of the low-cost measures?

b) Regarding the low cost to the customer for direct install measures, is the customer defined as the resident of the unit or is it the affordable housing or privately-owned multi-residential building owner or property manager?

c) Why is the list of in-suite measures limited to heat reflector panels and showerheads? Were other measures also evaluated, and if so, which ones and why were they excluded? Why were bathroom and faucet aerators excluded?

Response:

a) The following are the direct install specific measures provided at no-cost to the tenants:

   i. Heat Reflector Panels: the cost per measure varies as it is dependent on number and lengths of the hydronic (radiator or convectors) heating system.
   ii. Showerheads: the cost per measure varies and depends upon the (confidential) contract prices of Enbridge Gas's individual Delivery Agents.
   iii. Aerators: the cost per measure is varies and depends upon the (confidential) contract prices of Enbridge Gas's individual Delivery Agents.

   There are no low cost measures offered to the tenants proposed in the Plan. There will be several prescriptive and custom incentives provided to building owners/operators reducing the total cost of their energy efficient upgrades. The total cost of each measure varies based on the building size and products installed and may be significant enough to be considered low cost.

b) As defined in the eligibility criteria for the Affordable Housing Multi-Residential offering, referenced in Exhibit E, Tab 1, Schedule 3, pages 18 to 19, a participant is defined as an income qualified multi-unit residential building customer. Individual residents of the building are not eligible participants for this offering and do not pay any upfront costs when a building owner or property manager participates in the offering.

c) Exhibit E, Tab 1, Schedule 3, page 17, paragraph 43 was providing some examples of direct install measures under this offering. In addition to the heat reflector panels and showerheads, both kitchen and bathroom aerators are also included as a direct install measure for low income customers. No other in-suite measures were evaluated.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10b

Reference:

Exhibit E, Tab 1, Schedule 3, page 1

Question(s):

Enbridge Gas has a strong history of successful delivery of energy efficiency programs specifically designed to meet the needs of lower income customers.

a) Please summarize the key successes in delivery of Low Income programs to date.

b) Please summarize the key lessons learned in delivery of Low Income programs to date.

Response:

a) The following list provides examples of Enbridge Gas's key successes in the delivery of the low income program offerings to date:

Home Winterproofing Program (HWP)

- HWP continues to drive strong results across Ontario to single family homes; including on-reserve communities.
- Successful collaboration efforts with third parties; including with IESO on a collaborative delivery approach for Indigenous communities and the coordinated delivery model outlined in response to Exhibit I.10a.EGI.STAFF.30.
- Incorporated new products into the suite of low-income measures, such as external cladding and smart thermostats.
- Built a strong network with delivery agents, registered energy auditors, community organizations and government partners to develop collaborations and partnerships for program delivery, awareness and education such as LEAP.
- Developed robust marketing plans to inform hard-to-reach customers.

Affordable Housing Multi-Residential Program

- Continued strong participation that provided energy efficient upgrades to thousands of income qualified multi-residential buildings.
- Expanded the AHMR program from social housing providers to include privately owned multi-residential buildings.
- Developed robust marketing and outreach plans to inform hard-to-reach customers.

b) The following list provides examples of some of Enbridge Gas's key lessons learned in the delivery of the low income program offerings to date:

Home Winterproofing Program

- As the program matures, identifying and qualifying customers in this segment becomes more challenging, requiring more targeted communications, outreach strategies and engagement with local associations and other stakeholders.
- Health and Safety issues can be a significant barrier to program participation.
- Data sources to inform customers lists and marketing opportunities important to targeting sub segments of this sector.
- Partnerships and collaboration are key to continually being able to access customers in segment.

Affordable Housing Multi-Residential Program

- As the program matures in market, a gradual shift in market opportunities from Social Housing to Market Rate.
- Data sources to inform customers lists and marketing opportunities important to targeting sub segments of this sector.
- Program alignment between legacy utilities is required (i.e., eligibility requirements, incentives etc.) to reduce customer confusion and drive positive program outcomes.
- Partnerships and collaboration are key to continually being able to access customers in segment.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10b

Reference:

Exhibit E, Tab 1, Schedule 3, page 2

Question(s):

Enbridge Gas works closely with its network of community-based organizations, local community service providers, social and assisted housing networks, non-profit organizations, and faith-based organizations to gain trust and improve accessibility to programming.

Please discuss Enbridge Gas's plans to grow the network over the 2023 to 2027 period.

Response:

Over the course of the 2023-2027 DSM Plan, Enbridge Gas plans on growing this network by focusing on specific sub-sectors of the market and the organizations or associations that support these sub-sectors. Identification of these specific organizations and associations can occur through various channels; such as discussions with industry stakeholders and municipalities.

One of the recent sub segments identified was Off-Reserve First Nations communities and organizations. To connect with these organizations, Enbridge Gas is working with our dedicated Indigenous Affairs team to promote the program through Urban Indigenous Organizations, Indigenous Housing Entities and other collectives that serve Off-Reserve Populations.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10b

Reference:

Exhibit E, Tab 1, Schedule 3, page 4

Question(s):

Low income programming inclusion a health and safety budget to improve the safety and well-being of the home and aid in removing barriers to participation.

Please provide the health and safety budget for 2023.

Response:

Please see response to Exhibit I.6.EGI.LIEN.7a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10b

Reference:

Exhibit E, Tab 1, Schedule 3, page 4

Question(s):

Low income programming includes enhanced incentives, low or no cost direct install measures to improve economic feasibility of efficiency projects contributing to the preservation and improvement of the multi-residential social and assisted housing supply and privately-owned multi-residential buildings with high incidence of low income tenants.

a) Please provide further information on enhanced incentives.
b) Please discuss eligibility requirements for low cost compared to no costs.
c) Please quantify low cost for low income participants.

Response:

a) The Affordable Housing Multi-Residential offering is designed to offer multi-unit residential buildings, either owned by a Social and Assisted Housing provider or owners/managers of privately owned multi-residential buildings that meet the eligibility criteria supporting high incidence of low income tenants, with a menu of prescriptive, custom, and direct install measures. The measures and/or services offered are similar to those provided in the Company's Commercial Program, however, this offering provides enhanced incentives for those measures recognizing the greater financial barriers eligible participants must overcome.

b) The eligibility requirements for no and low cost are the same and are outlined at Exhibit E, Tab 1, Schedule 3, pages 18 – 20.

c) Please see response to Exhibit I.5.EGI.LIEN.2b.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10b

Reference:

Exhibit E, Tab 1, Schedule 3, page 8

Question(s):

The offering is delivered by third-party Delivery Agents ("DAs") across the franchise. DAs are responsible for customer intake, income qualification, pre and post energy assessments, and the installation of beneficial upgrades. DAs have access to a health and safety budget to complete minor improvements where barriers may exist to inhibit a customer's ability to participate in the offering.

Please provide the third party costs for the low income offering.

Response:

The costs for third-party Delivery Agents are variable and dependent upon the individual contracts with each Delivery Agent. Since third party contractual information is confidential and commercially sensitive, only the aggregate can be shared and is approximately $1.3M.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Issue 10b

Reference:

Question(s):

Please complete the following table.

Low Income Offering	2015 Target Market Size	2015 Participants (Actual)	2020 Participants (Actual)	2023 Target Market Size	2023 Participants (Forecast)	2023 Avg Participant Incentive ($)	2023 Avg Participant NG savings (m3)
Home Winterproofing							
Affordable Housing Multi-Residential Offering (AHMR)							

Response:

2015 Target Market Size is not available.

For 2015 and 2020 Participants (Actual) please see the response to Exhibit I.5.EGI.GEC.6.

For the 2023 Target Market Size, 2023 Participant (Forecast) and 2023 Avg Participant NG savings please see the response to Exhibit I.6.EGI.LIEN.6b.

For the 2023 Avg Participant Incentive see the response to Exhibit I.5.EGI.GEC.7.

Note that participants in the above references are based on how Enbridge Gas tracks participants and often units or measures. See the details in the above responses for further information.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, pp. 1-6

Question(s):

Enbridge Gas notes the general composition of the commercial sector and limitations to participation for customers.

a) Please discuss how Enbridge Gas used customer data, including, but not limited to, consumption data, building age, and DSM program participation, to form its program delivery strategy and resourcing plan to ensure the program optimizes performance through targeting commercial customers with the oldest buildings, customers with limited past program activity, and buildings that use a higher proportion of natural gas relative to comparable buildings. In your response, please include all analysis, including anonymized customer data sets, used to arrive at the program proposal.

b) Please discuss how the customer incentive levels and maximums for each commercial offering were developed and finalized.

Response

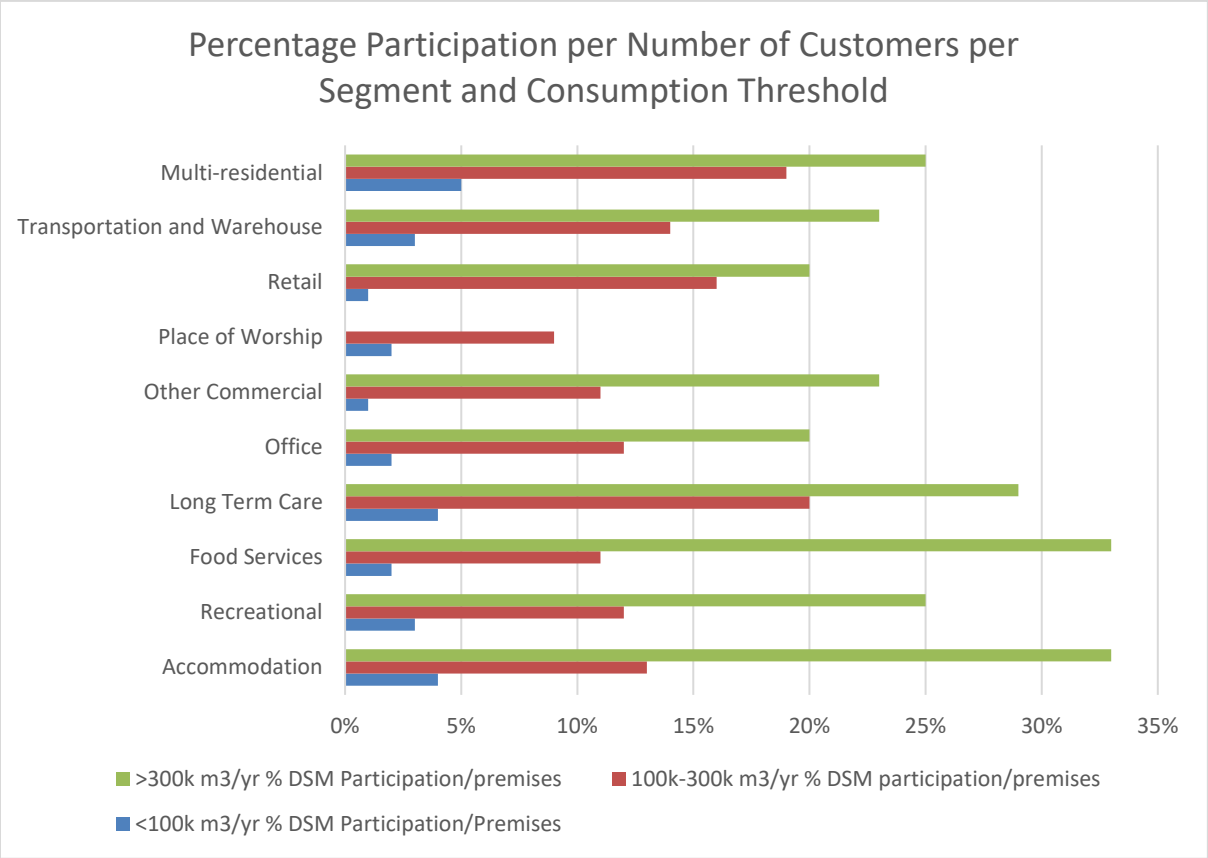
a) Enbridge Gas used customer data sets, which included information on consumption, participation, and classification, to inform its understanding of the commercial sector and formulate a program strategy based on proper segmentation. The data sets included Enbridge Gas customer data and MPAC data. The segmentation determined the proper way to engage with customers and therefore the mix of programming, the approach to delivery and the use of resources.

   From the perspective of program delivery, customer data is used to support program delivery in the following ways:

- Enbridge Gas directly targets buildings by age for specific campaigns, such as when they would be due to replace a boiler or HVAC system.
- Enbridge Gas mines its customer database to identify customers with limited past program activity and targets them with the Direct Install offer
- Enbridge Gas identifies schools that use a higher proportion of gas relative to comparable buildings through benchmarking, which is integral to the proposed Whole Building P4P offer

Furthermore, as noted in Exhibit E, Tab 1, Schedule 4, page 10, ESAs typically have a market segment focus and serve as a subject matter expert on related load profiles, end uses, industry best practices and barriers faced by customers within the segment they serve.

In addition to the macro level market analysis shared in Exhibit E, Tab 1, Schedule 4, page 2 of 36, Table 1, that illustrates market size and segmentation breakdown by account and consumption threshold, the following chart provides an example of how the market was further broken down by segment to properly assess the appropriate consumption threshold size relative to historical participation and penetration levels.



As demonstrated in the above chart, penetration of commercial customers who consume less than 100,000m^3/yr. is significantly lower than those who fall within the other two consumption thresholds evaluated. This analysis formed the premise of setting the 100,000 m^3/yr. threshold to define small versus large commercial customers.

Furthermore, the chart demonstrates that certain market segments, such as food services, offices, places of workshop and "other" commercial customers who consume less than 100,000m^3 of natural gas per year, have particularly low market penetration levels relative to other segments. Therefore, focus has and will continue to be placed on increasing penetration among small customers within these market segments. Examples of how they are being addressed in the proposed Commercial program include the addition of commercial kitchen appliances to the Prescriptive Midstream offering, as well as the extension of direct install measures to include Demand Control Kitchen Ventilation (DCKV) and Pedestrian Air Doors.

b) The process for developing customer incentive levels and maximums for each commercial offering are provided below.

The Commercial Custom offer has opportunity identification incentives and project implementation incentives. The proposed opportunity identification incentives (i.e., up to 50% or a maximum of $10,000 for costs associated with third-party audits, studies, and metering) are based on typical costs for these sorts of activities and experience in determining the level of coverage that stimulates uptake. Regarding the proposed project implementation incentives, the rate of $0.25/$m^3$ was developed to accommodate changes in codes and standards which directly impact incentives:

- As baselines become higher, achievable savings tied to a project become lower, resulting in the need for a higher $/$m^3$ to be able to maintain the existing incentive level to support project uptake.
- As baselines become higher, customers are pushed towards purchasing higher efficient equipment, which is typically more costly and requires more upfront financial support to overcome barriers.
- The market research Enbridge Gas conducted (see Exhibit E, Tab 1, Schedule 4, Attachment 1) highlighted financial barriers as an obstacle to investing in energy efficiency measures. Increasing incentives will therefore help reduce financial barriers and increase uptake in efficiency measures.
- The incentive maximum of 50% of incremental project costs to a maximum of $50,000 was developed from an analysis of historical commercial projects, where it was identified that very few projects would earn incentives above $50,000. This cap sets a realistic expectation for customers.

As outlined in the footnote 10, in Exhibit E, Tab 1, Schedule 4, page 19 of 36, limited time increased incentive offers (LTOs) may also be made available from time to time to drive adoption of specific measures and/or behaviours.

The Prescriptive Downstream offer has unique incentives for each measure within the offer. As noted in Exhibit E, Tab 1, Schedule 4, page 29, proposed incentives are designed to cover approximately 40% of the incremental equipment cost, as outlined in the TRM. Enbridge Gas determined this level of cost coverage based on its own experience, jurisdictional research, and feedback from the Mid-Term Review. Enbridge Gas may supplement these base incentives with special offers. This would include multi-unit bonuses to encourage national accounts to adopt measures across multiple buildings. The maximum incentive for each measure would not exceed the incremental equipment costs.

The Prescriptive Midstream offer has unique incentives for each measure. Incentive design is based on the proportion of the average incremental cost that it can cover. As noted in Exhibit E, Tab 1, Schedule 4, page 35, incentives were established in consultation with the contracted delivery agent who has extensive experience delivering midstream programs across other jurisdictions. Incentives to mid-market actors are fixed; therefore, there are no maximums.

The Direct Install offer designs unique incentive levels for each measure within the offer. As noted in Exhibit E, Tab 1, Schedule 4, page 25, proposed incentives are designed to cover approximately 75-80% of the incremental equipment cost, as outlined in the TRM. In addition, the incentive will cover up to 50% of the installation cost. Incentives are designed to specifically attract hard-to-reach customers who are especially price sensitive. These incentive levels, combined with the turnkey delivery of the offer, work to minimize the customer’s capital outlay. Incentives are fixed; therefore, there are no maximums.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, p.5

Question(s):

Enbridge Gas notes that larger customers consuming more than 100,000 m3/year represent 5% of commercial accounts but 57% of annual commercial consumption.

a) Please provide the proportion of program participants since 2015 that are new participants.

Response

Approximately 26% of all commercial customers consuming more than 100,000 m^3/year participated in Enbridge Gas' DSM programs between 2015 and 2020.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, p.6

Question(s):

Enbridge Gas notes that, as shown in the Ipsos research survey of commercial customers, simplicity and low levels of effort and knowledge is key to engaging smaller customers.

a) Please complete the following table with data from the Commercial & Industrial Direct Install offering for each year of the past DSM term.

Legacy Utility	OEB-Approved Budget	Actual Spend	Variance

b) Please discuss the reasons for any years where spending was not at or above the OEB-approved budget.

Response

a) Please see tables below:

Year	Legacy Utility	OEB-Approved Budget	Actual Spend	Variance
2015	Legacy Enbridge	n/a	n/a	n/a
2016	Legacy Enbridge	$4,955,421	$2,390,902	-$2,564,519
2017	Legacy Enbridge	$5,060,872	$1,807,641	-$3,253,231
2018	Legacy Enbridge	$4,758,344	$1,726,487	-$3,031,857
2019	Legacy Enbridge	$4,853,510	$3,887,196	-$966,314
2020	Legacy Enbridge	$4,950,581	$2,004,811	-$2,945,770

Year	Legacy Utility	OEB-Approved Budget	Actual Spend	Variance
2015	Legacy Union	n/a	n/a	n/a
2016	Legacy Union	$500,000	$0	-$500,000
2017	Legacy Union	$2,500,000	$1,449,230	-$1,050,770
2018	Legacy Union	$2,500,000	$1,355,104	-$1,144,896
2019	Legacy Union	$2,500,000	$2,011,911	-$488,089
2020	Legacy Union	$2,500,000	$537,480	-$1,962,520

b) There are several reasons to explain why the Direct Install offering was not fully spent over the plan term for both Union Gas and Enbridge Gas Distribution as summarized below:

- Ramp up time was needed to initiate the offering in market from delivery agent procurement to offer launch and customer engagement
- Conversion rates are low
- Introduction of additional measures to the offer had low results
- COVID impacts were significant on small commercial customers

As included in Exhibit E, Tab 1, Schedule 4, page 22, enhanced incentives, marketing initiatives and expansion of delivery agents have been proposed to address uptake of new measures moving forward.

Enbridge Gas used the spend variance in other sectors where there were incremental opportunities.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, p.7

Question(s):

Enbridge Gas notes that in its ongoing efforts to more effectively engage smaller, harder to reach customers, it will continue to enhance its relationships with these channels as they represent a more cost-effective means to do so.

a) Please provide specific examples and process changes Enbridge Gas proposes to implement to better reach and engage with traditionally harder to reach, smaller commercial customers.

Response

a) To better reach and engage with traditionally harder to reach, smaller commercial customers, Enbridge Gas will be increasing engagement with service providers responsible for maintaining and installing equipment at customer sites to educate and enable them to support program offerings. This may take shape in the form of engaging distributors and retailers to actively stock and promote efficient equipment to service providers, as is the case with the proposed Prescriptive Midstream offering (see Exhibit E, Tab 1, Schedule 4, pages 31-32, paragraphs 102-103). Or it may involve developing training and tools to enable service providers to provide customers with incentive quotes and submit project applications, as outlined in the commercial custom offering (see Exhibit E, Tab 1, Schedule 4, pages 19-20, paragraph 55). It could also involve working with service providers to provide customers with a turnkey solution, as is the case of the Direct Install offering (see Exhibit E, Tab 1, Schedule 4, page 22, paragraph 64).

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, p.12

Question(s):

Enbridge Gas indicates it will initiate fast-feedback surveys with commercial customers that will allow for more direct and relevant project feedback.

a) Please provide a copy of the fast-feedback survey. If not available, please provide specific examples of the kinds of questions that will be included.

b) Please discuss how this survey will assist in lowering free ridership levels.

c) Please discuss if Enbridge Gas will provide the survey to the OEB's EAC and EC for comment, if the program is approved.

Response

a) Enbridge Gas led fast-feedback surveys are still under development. Enbridge Gas expects they will be designed similarly to the EC's NTG study, however in a shorter format with a focus on understanding specific influence components of the program.

b) Fast-feedback surveys will assist in lowering free ridership levels by providing Enbridge Gas with "clear, direct and actionable feedback" as outlined in Exhibit E, Tab 1, Schedule 5, page 14, paragraph 42, that can then be incorporated into the design and delivery of its offerings to increase the utility's influence.

c) It is unlikely the EAC and EC would be engaged in the review or development of Enbridge Gas's fast-feedback surveys, as such tasks would be outside the scope of the EAC. Free-ridership mitigation tactics (including fast-feedback surveys) are a product of program design and implementation, which is the accountability of the utility (in contrast to free ridership impact evaluation, which is the accountability of the EAC).

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, p.20

Question(s):

Enbridge Gas suggests that free ridership studies are conducted every 2 years for the commercial custom program and that the focus of the studies should be based on areas where the offering design has been changed.

a) Please specify the areas of the offering that have changed and where Enbridge Gas suggests the focus of the studies be placed. In your response, discuss how this compares to the most recent study in 2018.

Response

Enbridge Gas continuously assesses its custom program design and delivery to improve free-ridership. Changes to the offering since the last net-to-gross study that was conducted in 2018 that are currently underway, or are proposed as part of the DSM Plan and are anticipated to impact overall results include:

- Applying harmonized approaches to project eligibility, screening and substantiation requirements that incorporate best practices from each of the previous separate utility offerings. Examples of harmonized approaches include:
    - applying common baseline assumptions for custom projects; and
    - leveraging e-Tools to support boiler projects, which requires site-specific inputs to calculate project savings over baselines, and therefore increases substantiation requirements associated with these types of projects.
- Proactively adjusting baselines for certain custom measures, to more accurately reflect the current market practice. This reduces the utility's gross measurement and if implemented correctly, should reduce net-to-gross adjustments.

- Enhancing engagement with service providers though the provision of additional training and sales/market support materials in an effort to influence service providers to in-turn influence customers to adopt high-efficiency measures. Future consideration of net-to-gross studies should therefore incorporate utility influence over service providers in addition to customers.
- Going forward into 2022, Enbridge Gas-led fast-feedback surveys will be conducted, with input from the surveys incorporated into enhancing the offering.

Prior to the execution of a net-to-gross evaluation, the EC should continue the practice of engaging the utility to understand these types of -changes, so they can consider them for the study's design and execution where appropriate. Furthermore, as has been discussed by the EC and EAC in recent years, net-to-gross evaluations should be conducted in real-time as much as possible, to derive as accurate results as possible.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, p.22-26

Question(s):

Enbridge Gas outlines its proposed Direct Install offering.

a) Please discuss Enbridge Gas's process for determining the measures included in this offering.

b) Please discuss the customer's process of determining and evaluating what measures to install and what advice or guidance is provided by Enbridge Gas, if any.

c) Please discuss the intake process for customers enrolling in this offering.

d) Please discuss if there are any custom measures available as part of the Direct Install offering. If so, under what conditions or terms must customers agree to?

Response

a) Enbridge Gas has considered all possible measures in the TRM that cater to small customer needs as a potential measure for the Direct Install offer. Measures are generally prioritized for inclusion on the following basis:

- natural gas savings in relation to the installed cost – measures that yield greater gas savings per incentive dollar make it easier to justify the higher cost coverage that is customary of a direct install offer
- baseline conditions in the market and market potential – measures that historically had low uptake and high remaining market potential are well suited
- Measures that are not better suited to a midstream model. Measures included in the Midstream offering are excluded from downstream offerings,

such as the Direct Install and Prescriptive Downstream offerings, to avoid market confusion and the risk of double incenting customers for the same project. Although the Midstream model provides a means of reaching a broader audience per measure than a downstream model, not all measures are well suited for midstream. Ideal midstream measures include those that:

- are simple to install by contractors
- have consistent baselines for energy savings calculations, as distributers and retailers have limited access to site-specific information
- target replacement on burnout – equipment availability at a distributor or retailer level plays a significant role in influencing replacement on burnout technology decisions

To broaden market reach, Enbridge Gas is also working to develop an external facing tool to aid with savings calculations and training for service providers to enable them to support a broader group of measures beyond those approved in the TRM, as outlined in Exhibit E, Tab 1, Schedule 4, page 19, paragraph 55. Furthermore, Enbridge Gas will continue to actively identify and pursue new measures to introduce into the TRM over the plan term.

b) As outlined in Exhibit E, Tab 1, Schedule 4, page 24, paragraph 71, Enbridge Gas will contract service providers who will engage with customers to identify, qualify, quote, and install eligible measures in their facilities. Contracted service providers may be provided with a site assessment tool and training to support the identification of other opportunities in the customer's facility, as articulated in Exhibit E, Tab 1, Schedule 4, page 25, paragraph 77.

c) Enbridge Gas will promote the offer to customers via a series of marketing and outreach activities. Once they have engaged with Enbridge Gas, customers will be screened for eligibility. Eligible customers will then be assigned to a contracted service provider who will work with them directly to solution (assess, educate, quote, install) equipment within their facility.

d) Please see response to part a and/or reference Exhibit E, Tab 1, Schedule 4, page 19, paragraph 55.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, p.33

Question(s):

Enbridge Gas highlights the objectives and details of its proposed commercial prescriptive midstream offering.

a) Please list and discuss the midstream programs in other jurisdictions that Enbridge Gas reviewed when developing its program. Please highlight the elements of other programs that Enbridge Gas has incorporated into its design and discuss the ways in which Enbridge Gas has used best practices and lessons learned from other jurisdictions in its proposed offering.

Response

In developing the proposed midstream offering, Enbridge Gas reviewed multiple midstream programs (similarly referred to as upstream) in other jurisdictions, as well as findings from specific organizations (i.e., AESP, SWEEP). Enbridge Gas also engaged CLEAResult in the development of the offering. CLEAResult currently supports the design and delivery of midstream offerings in multiple jurisdictions.
Specific examples of how Enbridge Gas incorporated best practices and lessons learned from other jurisdictions into the proposed midstream offering are highlighted below.

- Measures proposed for the midstream offering were heavily influenced by best practices outlined in other jurisdictions. These practices identify best suited measures as those that are simplified, i.e., off the shelf type equipment and simple to install or replace with consistent baselines for calculating savings. Consequently, by adopting these best practices, the types of measures Enbridge Gas is proposing to introduce as part of the Prescriptive Midstream offering, such as food service equipment and high-efficient water heaters, are consistent with SoCalGas and PG&E's midstream Point of Sale Food Service and Distributor Water Heating programs. Proposed midstream measures also line up with

recommendations from the presentation provided by Environmental Defence and the Green Energy Coalition at the Mid-Term Review Stakeholder Meeting in September of 2018.[1]

- Distributor and retailer enabling initiatives such as training, streamlined application forms and flexible incentive structures were adopted into the offering based on best practices identified by program administrators in other jurisdictions identified in the report on Upstream Utility Incentive Programs associated with the Southwest Energy Efficiency Project (SWEEP).[2]
- In developing the targets and budgets associated with the Prescriptive Midstream offering, consideration was made to potential market impacts of transitioning projects from downstream to midstream, whereby a midstream approach has been demonstrated to provide broader reach, as demonstrated in the Energy Futures Group presentation on Broadening the Application of Upstream Incentives in the Utilities' Next 3-Year Plans.[3]

[1] Chris Neme and Kent Elson, Energy Futures Group, Mid-Term Review Stakeholder Meeting, Environmental Defence and the Green Energy Coalition (September 6, 2018).
[2] Maureen Quaid and Howard Geller, Upstream Utility Incentive Programs: Experience and Lessons Learned, SWEEP Southwest Energy Efficiency Project (May 2014), p. 7. https://www.swenergy.org/data/sites/1/media/documents/publications/documents/Upstream_Utility_Incentive_Programs_05-2014.pdf
[3] Chris Neme (on behalf of NRDC), Energy Futures Group, Broadening the Application of Upstream Incentives in the Utilities' Nest 3-Year Plans (November 16, 2015), pp. 2 – 3. https://s3.amazonaws.com/ilsag/SAG_Upstream_Incentives_Presentation_NRDC.pdf

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 4, pp. 35-36

Question(s):

Enbridge Gas notes the evaluation activities it recommends for the midstream offering.

a) Please discuss if Enbridge Gas supports a process evaluation of the midstream offering. In your response, please discuss Enbridge Gas's position on running a process evaluation during the first year of delivering the offering to ensure that it is being rolled-out in an effective manner.

Response

a) Please see response to Exhibit I.10a.EGI.STAFF.38

Enbridge Gas notes that it is currently executing a process evaluation on its midstream offering. On August 11th, 2021, Enbridge shared a draft document describing the midstream offering and the objectives of the process evaluation with the Evaluation Contractor ("EC") and Evaluation and Audit Committee ("EAC") for their review and commentary. Following the commentary period, Enbridge Gas received comments from 3 parties:

- DNV (EC)
- Two independent EAC members

The Company did not receive any commentary back from other EAC members or OEB Staff.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 5, pp. 9-10

Question(s):

Enbridge Gas notes that it has proposed a distinct industrial program to ensure appropriate effort and resources are allocated towards maximizing savings potential within the sector and driving deep savings.

a) Please discuss the changes that will take place if the proposed industrial program is approved compared to the resources, planning, strategy and delivery of the combined custom C&I program in place during the 2015-2020 plan.

b) Please discuss the specific ways that Enbridge Gas will work towards maximizing energy savings from industrial customers, including responding to responses to the Ipsos survey and in-depth interviews with customers, reallocating Enbridge Gas staff, savings potential analysis, reviewing and adjusting incentive levels, targeted sales, enhanced education/marketing component, and any other new or enhanced parameters.

c) Please discuss the specific actions that Enbridge Gas will take to engage, educate, provide technical support and analysis to industrial customers all in an effort to enroll more industrial customers in its program.

Response

a) Historically, there were distinct C&I programs between each legacy utility. Now that the two legacy utilities have merged, and the number of accounts that fall within each sector have essentially doubled in size, Enbridge Gas has a single program to support commercial customers and a single program to support industrial customers across the entire franchise.

From a resourcing perspective, in the past, despite having C&I under one program, Energy Solutions Advisors were assigned to support customers at a sector level, with specific advisors targeting industrial accounts and others supporting commercial accounts. With the proposed distinct programs, Advisors will continue to work with the specific market sectors they support, however they have more defined savings targets to achieve associated with each sector. This will ensure resources are allocated to maximizing savings potential within each sector.

By splitting focus of programming between the commercial and industrial sectors, additional effort has been placed on evaluating market specific needs to better position offerings to overcome barriers within each sector. The enabling initiatives and financial incentive structures associated with the Industrial Custom offering have been specifically designed to address the unique and complex challenges of identifying, quantifying, and implementing efficiency measures within an industrial site that often require a one-to-one ESA to customer approach. In contrast, to reach a broader group of commercial accounts, emphasis has been placed on structuring offerings to expand market delivery channels by enabling service providers to support offerings such as Direct Install, Prescriptive and select Custom offering measures.

b) Enbridge Gas endeavors to maximize energy savings from industrial customers in the following specific ways:

- Disaggregating its legacy energy management offers and expanding the range to include energy management system implementation – Exhibit E, Tab 1, Schedule 5, page 10, paragraph 27.
- Reducing free ridership rates by adopting best practices across both legacy programs – Exhibit E, Tab 1, Schedule 5, page 14, paragraph 45.
- Aligning the incentive structure and optimizing it to provide greater opportunity for small accounts – Exhibit E, Tab 1, Schedule 5, page 13, paragraph 40.
- Continuing to invest in the development of ESAs, whose technical support is noted in the Ipsos research report as being as influential as the incentives themselves - Exhibit E, Tab 1, Schedule 5, Attachment 1, page 1.

c) Specific actions to enroll more industrial customers in the program include:

- Redesign of incentive levels to make smaller energy projects more affordable, resulting in enhanced program reach and support for industrial customers who are less likely to have previously participated in the offering – Exhibit E, Tab 1, Schedule 5, Page 12, Paragraph 40.

- Onboarding and re-deploying additional ESAs to enable reach of smaller volume industrial accounts – Exhibit D, Tab 1, Schedule 1, page 24, paragraph 28.
- Continuing with communication initiatives, including providing customers with technical publications, case studies, quarterly electronic updates, and workshops to generate awareness and interest in the offering – Exhibit E, Tab 1, Schedule 5, page 11, paragraph 32.
- In addition to the Industrial program, industrial customers will be eligible to participate in the Commercial Prescriptive Downstream, Direct Install and Prescriptive Midstream offerings – Exhibit E, Tab 1, Schedule 5, page 7.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Energy Probe Research Foundation (EP)

Interrogatory

Issue 10c

Reference:

Exhibit D Tab 1 Schedule 3 Pages 2-4 Table 3; Exhibit E Tab 1 Schedule 4:
Commercial Custom Prescriptive Downstream and Direct Install Prescriptive Midstream Offers

Preamble:

Energy Probe has previously made several submissions critical of the effectiveness of certain Market Transformation programs Run it Right and xxx offers. EGI has responded to these submissions that this was a matter to be addressed in this EB-2021-0002 Proceeding. The Board agreed with EGI in its EB-2020-0072 Decision.

Question(s):

a) Please provide a complete response that addresses the reasons that these two MT programs have been dropped and replaced by the proposed prescriptive offers.

b) Who was consulted in preparing these offers?

c) Has EGI piloted these new offers? If so please provide the results.

d) Will EGI focus delivery using ESAs? Are ESAs EGI employees? If so, how many full and part time. If not, how many ESA consultants are qualified by EGI?

e) Will EGI pay ESAs a fee or commission? Please provide details.

Response:

a) Please see response to Exhibit I.9b.EGI.EP.12a.

b) Please see response to Exhibit I.9b.EGI.EP.12b.

c) Please see response to Exhibit I.9b.EGI.EP.12c.

d) Please see response to Exhibit I.9b.EGI.EP.12d.

e) Please see response to Exhibit I.9b.EGI.EP.12e.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 5, p.13

Question(s):

Enbridge Gas proposed the following incentive structure for the industrial program:

- $0.20/m3 saved for the first 50,000 m3 saved
- $0.10/m3 saved for each m3 saved beyond 50,000 m3
- Note: savings capped at $100,000 per project and should not exceed 50% of incremental project costs (unless in special cases).

a) Please discuss and provide any analysis conducted prior to filing related to how changing the second tier of the incentive (savings over 50,000 m3) from $0.05/m3 (in the previous DSM term) to $0.10/m3 will impact the total incentive costs for the program on an annual basis, the average incentive cost for individual projects, and the overall savings projected from the program.

b) Please discuss if Enbridge Gas considered raising the overall incentive available per project or the maximum threshold of savings per project. In your response, please indicate if any savings potential analysis was conducted. If so, please provide this analysis.

c) Please discuss if these incentive levels were canvassed among industrial customers to get a sense of the ideal level of incentives and payback periods to attract more industrial customers, particularly those that have never participated.

Response

a) An analysis was conducted to evaluate the difference between former incentive levels associated with historical projects of manufacturing customers (based on 2018-2019 projects) relative to the newly proposed tiered incentive structure. The results are as follows:

- Average overall incentive costs associated with the program increased by approximately 11%
- Average incentives associated with individual projects that result in savings less than 50,000 m^3/year, increased by 19%.
- Average incentives associated with individual projects that resulted in savings greater than 50,000 m^3/year, increased by 10%.

As indicated in Exhibit E, Tab 1, Schedule 5, page 13, paragraph 40, this enhanced incentive structure is intended to make smaller energy projects more affordable, thereby enhancing reach and supporting industrial customers who are less likely to have previously participated in the offering. The higher above the 50,000 m^3/year savings threshold a project is, the lower the incremental incentive value will be, as projects that yield higher energy savings will likely result in meaningful cost savings and therefore require less financial incentive to make the energy project viable.

As outlined in Exhibit D, Tab 1, Schedule 1, pages 23-24, paragraph 28, Enbridge Gas forecasted an increase in the number of projects by more than 25% over historical levels. Although the proposed tiered incentive structure plays a role in the incremental project forecast, it is only part of the equation, as a variety of additional factors such as the proposed increase in Energy Solutions Advisors, and the many enabling initiatives to drive interest and engagement in the program outlined in Exhibit E, Tab 1, Schedule 5, page 11, paragraphs 32-35, are equally important in the achievement of the forecasted incremental results.

b) As outlined in Exhibit E, Tab 1, Schedule 5, page 4, paragraphs 9-17, there are a variety of barriers beyond financial constraints that impact customer participation and results.

Enbridge Gas believes that the proposed tiered incentive structure will best position the offering to support a broad range of large and small projects, as described in Exhibit E, Tab 1, Schedule 4, page 13, paragraph 40. That said, limited time campaigns will be made available throughout the year to test impacts of different incentive structures on driving results associated with targeted measures or customer groups.

c) Enbridge Gas conducted surveys with Industrial customers to get a sense of ideal incentive levels and payback periods (see Exhibit E, Tab 1, Schedule 5, Attachment 1 and Exhibit E, Tab 1, Schedule 5, Attachment 2.). The proposed increased incentive structure was designed to better accommodate findings from the surveys. It was canvassed among Industrial Energy Solutions Advisors, who act as extensions of our Industrial customers' teams. It is also important to note that the surveys revealed that overcoming other barriers, such as technical and human resource constraints can be equally or even more important to overcome than financial barriers. The proposed Industrial Program aims to balance enabling and implementation initiatives and incentives to increase participation in the offering.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10c

Reference:

Exhibit E, Tab 1, Schedule 5, p. 14

Question(s):

Enbridge Gas notes that it has proposed several enhancements to optimize overall performance and mitigate free ridership in the industrial custom offering.

a) Please expand on what the proposed "fast-feedback surveys" will include and how Enbridge Gas will use the information from the surveys to help mitigate free ridership.

b) Please discuss if this survey will be the same or similar to the survey used on commercial customers.

c) Please discuss if Enbridge Gas will seek the OEB's EAC and/or EC comments on the fast-feedback survey prior to launch.

Response

a) Please see response to Exhibit I.10c.EGI.STAFF.47a and b.

b) As noted in response to Exhibit I.10c.EGI.STAFF.47a, Enbridge Gas-led fast-feedback surveys are still under development. Enbridge Gas expects the surveys used for commercial and industrial customers would be similar, with some variation to account for the role of service providers in influencing commercial projects.

c) Please see esponse to Exhibit I.10c.EGI.STAFF.47c.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10d

Reference:

Exhibit E, Tab 1, Schedule 4, p. 17

Question(s):

Enbridge Gas notes that it will explore process evaluation topics throughout the term of the plan.

a) Please provide a list of all the process evaluations of the custom industrial offering that have taken place since 2015. In your response, please provide the full studies and summarize the conclusions.

Response

Please see response to Exhibit I.5.EGI.STAFF.10a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 1, Schedule 6, pp. 7

Question(s):

Enbridge Gas describes how the direct access model is administered.

a) Please complete the table below summarizing large volume program activity since 2015. In your response, please include the number of large volume customers eligible to participate in the program each year, how many customers actually participated, the average incentive amount accessed per customer, the average cost per customer directly related to this program, the average net annual and cumulative natural gas savings achieved, and the annual cost-effectiveness result of the program as a whole.

Historical Large Volume Program Activity						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Number of Eligible Large Volume Customers						
Number of Large Volume Program Participants						
Average Annual Participant Incentive Paid						
Average Annual Non-incentive Program Costs per Customer						
Average Net Annual Natural Gas savings (m3) per Participant						
Average Net Cumulative Natural Gas Savings (m3) per Participant						
Large Volume Program Cost-Effectiveness						

Response

As outlined in Exhibit E, Tab 1, Schedule 6, page 7, Large Volume Program Proposal, Eligibility Criteria, “To be eligible for the offering, participants must be an Enbridge Gas customer in Rate T2 and Rate 100 in the Union rate zones as of January 1st in a given program year.”

To note, there are no Large Volume Program Customers in the EGD rate zone.

Please see table below for legacy Union’s large volume program activity since 2015.

Legacy Union

Historical Large Volume Program Activity

	2015[1]	2016	2017	2018	2019	2020
Number of Eligible Large Volume Customers		36	38	36	37	37
Number of Large Volume Program Participants		18	20	22	25	27
Average Annual Participant Incentive Paid		$135,624	$105,717	$106,405	$107,379	$131,228
Average Annual Non-incentive Program Costs per customer[2]		$30,441	$25,421	$21,863	$16,165	$20,522
Average Net Annual Natural Gas savings (m3) per participant		376,225	473,723	366,170	281,876	555,175
Average Net Cumulative Natural Gas Savings (m3) per Participant		4,436,017	6,290,206	4,054,404	2,894,808	5,756,703
Large Volume Program Cost-Effectiveness (TRC-PLUS RATIO)		5.20	1.80	2.47	2.32	5.63

Note:

(1) 2015 Large Volume Program included Union Rate Zones T2, T1 South and R100 North. Due to this 2015 isn't directly comparable to 2016-20, and therefore has been removed.

(2) "Non-incentive Program Costs" include Administration, Promotion and Evaluation Costs.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 1, Schedule 6, pp. 7

Question(s):

Enbridge Gas outlines the incentive structure associated with the direct access offering.

- Engineering Feasibility Study: 50% funded up to $10,000
- Process Improvement Study: 66% funded up to $20,000
- Steam Trap Survey: 50% funded up to $6,000
- Metering: 50% of meter costs funded up to $5,000

In addition, for new and retrofit equipment, process optimization, and operational improvements, participants can receive:

- Direct Access Incentive Pool: $0.10/m3 saved up to the lesser of $100,000 or 50% of project costs, and
- Aggregate Pool: $0.05/m3 saved up to the lesser of $40,000 or 50% of project costs.

a) Please provide a table that shows the actual incentives paid per project for each available funding stream noted above since 2015.

b) Please provide a table similar to the one below for each year from 2015-2020. Please include in each annual table, the number of projects completed, and for each incentive stream: the number of projects that reached the maximum incentive cap for that steam, and the average incentive amounts unused per project

2015 Large Volume Program Incentive Information			
Incentive Stream	**Total Number of Projects Completed**	**Number of Projects that Reached Incentive Maximum**	**Average Incentive Amount Remaining per Project Completed**
Engineering Feasibility Study			
Process Improvement Study			
Steam Trap Survey			
Metering			
Direct Access Incentive Pool			
Aggregate Pool			

c) Please explain how incentive levels and budget were selected for the enhanced Large Volume program, given the large amount of cost-effective savings available from large volume customers but also historically high free ridership levels for this program.

d) Please discuss if large volume customers participating in the program are required to follow any project level measurement and verification protocols in order to receive funding (in addition to any third-party evaluations conducted by the utility or OEB).

Response

a) Please see the following table.

Large Volume Program Total Incentive Information[1]					
Incentive Stream	2016	2017	2018	2019	2020
Engineering Feasibility Study	$ 39,505	$ 23,866	$ 10,000	$ 38,746	$ 47,709
Process Improvement Study	$ 171,952	$ 166,106	$ 277,437	$ 421,417	$ 321,915
Steam Trap Survey	$ 17,497	$ 14,429	$ 33,765	$ 39,752	$ 82,545
Metering	$ 37,058	$ 66,500	$ 35,000	$ 49,412	$ 69,003
Direct Access Incentive Pool	$ 2,189,998	$ 2,196,782	$ 2,081,581	$ 1,969,079	$ 1,758,239
Aggregate Pool[2]			$ 14,628	$ 12,628	$ 560,288

Notes:
(1) 2015 Large Volume Program not included due to T1 South inclusion in program.
(2) Tracking data from 2016, 2017 didn't distinguish Aggregate Pool

b) 2015 Large Volume Program Incentive are not provided due to the inclusion of Union Rate Zone T1 South. Due to this 2015 isn't directly comparable to 2016-2020.

2016 Large Volume Program Incentive Information			
Incentive Stream	Total # of Projects Completed	# of Projects that Reached Incentive Maximum	Average Incentive Amount Remaining per Project Completed
Engineering Feasibility Study	3	2	$ 165
Process Improvement Study	11	8	$ 6,186
Steam Trap Survey	5	1	$ 2,501
Metering	5	1	$ 1,488
Direct Access Incentive Pool	56	6	$ 64,464
Aggregate Pool[1]			

Notes:
(1) Tracking data from that year didn't distinguish Aggregate Pool

2017 Large Volume Program Incentive Information			
Incentive Stream	Total # of Projects Completed	# of Projects that Reached Incentive Maximum	Average Incentive Amount Remaining per Project Completed
Engineering Feasibility Study	3	1	$ 5,780
Process Improvement Study	17	1	$ 10,229
Steam Trap Survey	3	2	$ 1,191
Metering	4	3	$ 375
Direct Access Incentive Pool	49	6	$ 58,229
Aggregate Pool[1]			

Notes:
(1) Tracking data from that year didn't distinguish Aggregate Pool

2018 Large Volume Program Incentive Information			
Incentive Stream	Total # of Projects Completed	# of Projects that Reached Incentive Maximum	Average Incentive Amount Remaining per Project Completed
Engineering Feasibility Study	1	1	$ -
Process Improvement Study	19	10	$ 5,398
Steam Trap Survey	7	3	$ 1,176
Metering	3	2	$ 500
Direct Access Incentive Pool	41	12	$ 49,230
Aggregate Pool	1	0	$ 25,372

2020 Large Volume Program Incentive Information			
Incentive Stream	Total # of Projects Completed	# of Projects that Reached Incentive Maximum	Average Incentive Amount Remaining per Project Completed
Engineering Feasibility Study	6	4	$ 2,048
Process Improvement Study	20	13	$ 3,904
Steam Trap Survey	24	7	$ 2,561
Metering	14	7	$ 428
Direct Access Incentive Pool	42	10	$ 58,137
Aggregate Pool	24	7	$ 16,655

c) The $2.45M incentive budget in 2022 was based on the 5-year (2016 to 2020) average historical incentive spend. For a full budget breakdown, see CCC.10a, attachment 1. Incentive levels were determined through a balance of rate impacts while also providing sufficient direct-access budgets to ensure customers are motivated to undertake projects to utilize their allocation.

   Free ridership was not a consideration in setting the budget or incentive levels for the proposed Direct Access offering. Given the unique self-direct nature of the Large Volume Program, the methods used to evaluate free ridership are not appropriate because, as stated in Exhibit E, Tab 1, Schedule 6, page 9, par. 28, "…participants use their own funding to execute energy efficiency with support from Enbridge Gas.

d) Please refer to Exhibit E, Tab 1, Schedule 6, page 8, "Net annual natural gas savings achieved by customers in the Direct Access offering will be quantified by professional engineers using the custom engineered approach (determined relative to an Enbridge Gas approved baseline), incorporating the use of engineering calculations and process data. Due to the size, complexity and production variability of the customers participating in this offering, site meter-based analysis will not be used."

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 1, Schedule 6, p.8

Question(s):

Enbridge Gas indicates it has removed limitations on eligible measures from the large volume program in an effort to appeal to gas-fired electricity generators unique equipment needs.

a) Please discuss the reasons for why these measures were initially excluded.

b) Please discuss and provide any supporting documentation Enbridge Gas reviewed, including internal analysis used, to support the removal of all limitations on eligible measures.

Response

a) During previous DSM framework (2014 and earlier) Union had incented customers in Large Volume to maintain their gas-fired generators through turbine filters, wash and overhauls. During the most recent DSM framework (2015-2020) Enbridge Gas decided not to incent these activities due to their short EUL. Unfortunately, this decision unfairly impacted the gas-fired electricity generators whose participation in Large Volume has dropped during 2015-2020[1].

b) Enbridge Gas reviewed the proposed changes with stakeholders. "All parties who provided feedback on the changes expressed interest in allowances for more operational & maintenance type activities and believe this will increase their ability to utilize the funds and services available through the offering."[2]

[1] EB-2019-0271, EGI 2021 DSM Plan Interrogatory Responses (April 6, 2020), Exhibit I.APPrO.2.
[2] EB-2021-0002, DSM Multi-year Plan and Framework Application (May 3, 2021), Exhibit E, Tab 4, Schedule 6, p. 8.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 4, Schedule 6, pp. 7-9

Question(s):

As part of its discussion on stakeholder efforts in advance of filing its application, Enbridge Gas notes that feedback from large volume customers was “decidedly mixed”.

a) Please discuss if Enbridge Gas considered revising this program and allowing those customers that do not see the need or value in the program as they are already focused on energy costs and efficiency to opt-out, subject to confirmation and assurances that they have or will completed a certain threshold of efficiency improvements.

b) If Enbridge Gas has not considered an opt-out program design (e.g., customers can opt-out as long as they provide an energy plan and maintain the improvement schedule included within; participating customers pay for the level of programming they undertake and do not cross-subsidize other customers), please comment on the impact such a model may have on overall success of the program.

Response

a- b)

Enbridge Gas had some consideration of opt-out for the Large Volume program, but during that consideration found a number of difficulties.

Opt-out billing management would be extremely resource intensive. The existing billing system is not designed for opt-out. The current rate design and recovery for DSM costs make system design changes likely to be expensive, depending on the details of the opt-out rules, and frequency of customer opt-out opt-in. Any reconciliation on volumetric charges would have increased complexity with a non-homogeneous

customer set, as would all regulatory proceedings involving the rate classes involved. The mentioned additional requirements of, "*subject to confirmation and assurances that they have or will completed a certain threshold of efficiency improvements*" imply new processes and requirements on customers for compliance, and additional resources from the Company to track and report on compliance. The conclusion the Company reached was that any opt-out was impractical relative to the savings afforded to the participants wishing to opt-out. Enbridge Gas believes that an opt-out provision would increase program management and overhead costs to an extent that would outweigh any benefits to participants that wish to opt-out. The Company proposed to lower the LV Program budget materially in the DSM Plan and believes given the modest level of budget proposed that an opt-out provision should not be implemented.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 1, Schedule 6, p.9

Question(s):

Enbridge Gas indicates that over the term of the plan it will explore process evaluations for the large volume program.

a) Please discuss and provide a copy of all process evaluations Enbridge Gas (including legacy UG) have conducted in relation to the Large Volume Program.

Response

Please see response to Exhibit I.5 EGI.STAFF.10a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Association of Power Producers of Ontario (APPrO)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 1, Schedule 6, pp. 1 and 5-9

Preamble:

EGI's Direct Access Offering encourages large volume customers (LVCs) to maintain a focus on energy efficiency by encouraging the development of energy efficiency plans and encouraging action on identified efficiency opportunities.

Question(s):

a) For each of EGI's LVC rate class(es), please provide the following information in tabular format for 2020 (actuals), 2021-2022 (forecast), and 2023-2027 (proposed):

   (i) number of customers in each rate class and the proportion of those customers that are gas-fired generators (GFGs);
   (ii) number of customers in each rate class that participate in DSM programs and the proportion of those customers that are GFGs; and
   (iii) DSM costs allocated to the rate class (through base rates and deferral and variance accounts).

Response

a) i. As per EB-2021-0002, Exhibit E, Tab 1, Schedule 6, page 7 of 9 Large Volume Program Proposal, Eligibility Criteria:

> To be eligible for the offering, participants must be an Enbridge Gas customer in Rate T2 and Rate 100 in the Union rate zones as of January 1st in a given program year.

As such, there are no Large Volume Program Customers in the EGD rate zone.

Table 1
Large Volume Program Customers – Union Rate Zones

Union Rate Zones Rate Class	All Customers (2)			
	Actual	Unaudited (1)	Forecast	Forecast
	2020	2021	2022	2023-2027
T2 South	25	25	25	25
T2 South GFG	8	8	8	8
100 North	12	12	12	13
100 North GFG	1	1	1	1

Notes:
(1) 2021 Results are unaudited.
(2) Figures represent customer count at the beginning of each year.

ii.

Table 2
Large Volume Program DSM Participants – Union Rate Zones

Union Rate Zones Rate Class	DSM Participants	
	Actual	Forecast[1]
	2020	2021-2027
T2 South	18	TBD
T2 South GFG	3	TBD
100 North	9	TBD
100 North GFG	1	TBD

Notes:
(1) Enbridge Gas cannot forecast customer participation for 2021-2027.

iii. Please see Table 3 for the DSM costs included in rates for 2020, 2021, and 2022, as filed in the annual rates application for rate classes eligible for the Large Volume program.[1] Please see Exhibit F, Tab 1, Schedule 2, filed September 29, 2021, for the proposed DSM costs allocated to rate classes for 2023 to 2027. Note, Enbridge Gas has not filed DSM deferral and variance accounts for the referenced years. Please see response to Exhibit I.7.EGI.STAFF.17a for rate impacts inclusive of estimates for DSM deferral and variance accounts for 2023 – 2027.

Table 3
Board-Approved DSM Costs in Base Rates – Union Rate Zones

Union Rate Zones Rate Class	2020 EB-2019-0194 ($000s)	2021 EB-2020-0095 ($000s)	2022 EB-2021-0147 ($000s)
Rate T2	4,725	4,725	4,725
Rate 100	1,147	1,147	1,147

[1] The amounts provided include the total of program costs, overhead allocations and the low-income allocation.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Association of Power Producers of Ontario (APPrO)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 1, Schedule 5, Attachment 1
Exhibit E, Tab 1, Schedule 5, Attachment 2

Preamble:

EGI retained Ipsos to undertake a customer engagement process for industrial customers. Ipsos in its final report on DSM Next Generation customer engagement noted that "there is some room for improvement when it comes to the natural gas conservation program incentives in the eyes of participants."

Question(s):

a) Please provide a copy of all written instructions by EGI in relation to EGI's customer engagement for the DSM and the reports provided in Exhibit E, Tab 1, Schedule 5, Attachments 1 - 2.

b) Please provide any and all notes from the customer engagement relating to LVCs and GFGs that are supplementary to the reports provided in Exhibit E, Tab 1, Schedule 5, Attachments 1 - 2.

c) Please describe any and all feedback from or related to GFGs.

Response

a) Refer to Attachment 1 for a "Request for Quote" document sent to Ipsos by Enbridge Gas outlining instructions for the research objectives, suggested approach/methodology, target audience, and timelines for the research included in Exhibit E, Tab 1, Schedule 5, Attachment 1 and 2. Additional instructions regarding this research (sent from Enbridge Gas to Ipsos by email) are provided in Attachment 2. Large Volume customers were not included in the scope of this research.

b) In addition to the customer engagement outlined in Exhibit E, Tab 1, Schedule 5, Attachment 1 and 2, Enbridge Gas conducted one-on-one customer engagement specific to the Large Volume program. This customer engagement can be found in Exhibit E, Tab 4, Schedule 6, Attachment 3, with a high-level summary of notes provided in Exhibit E, Tab 4, Schedule 6, page 7-8. Due to confidentiality, Enbridge Gas is not able to share individual customer meeting summaries.

c) Please see response at Exhibit I.10e.EGI.APPrO.3b.

Next Gen DSM

Customer Engagement Research

Industrial Market
RFQ

Objectives of the Research

What are we trying to accomplish?

- The importance or relevance of energy efficiency and in particular natural gas efficiency;
- General awareness and reach of our programs;
- Key motivators and barriers to investing in energy efficiency initiatives/participating in programs;
- Key decision makers and biggest influencers for efficiency investments/participating in programs;
- Feedback on existing programs and potential enhancements to meet customer needs;
- Reasonable payback period to invest in energy efficiency;
- Types of efficiency opportunities that exist in facilities; and
- KPIs and whether or not energy is incorporated.

Determine balance between feedback on "current" program offerings and "new" program offerings:

- *Feedback on the "ideal" energy conservation program*

Target Audience

Who should be included?

- Focus on **customers** (just over 20,000 industrial customers in total)
- All sub-segments from both legacy utilities will be represented in the research

- *Food, Beverages & Kindred Products*
- *Fabricated Metals*
- *Agriculture & Greenhouse*
- *Chemical*
- *Consumer Goods & Non-Metallic Manufacturing*
- *Asphalt Paving & Roofing Materials*
- *Primary Metals*
- *Pulp & Paper*
- *Transportation Equipment & Machinery*
- *Concrete Gypsum & Plaster - Cement*
- *Stone, Clay, Glass & Concrete Products*
- *Pharmaceutical*
- *Mining, Quarrying, Oil & Gas Extraction*
- *Petroleum Refining*

- Limitations:
  - Do not include T2, Rate 100 customers (L-UG)
  - Do not include contract customers who are members of IGUA
  - Consider other stakeholdering activities and external decision-makers
  - Consider research projects that may be happening at the same time (e.g. Asset Management Plan Customer Engagement) – assume 50% of records will be available for this research
- Determine who we want to talk to:
  - DSM participants vs. non-participants (historical or recent) – will include both
  - Type of roles within the organization – bill-payers, decision-makers, operations managers, etc. provided in the sample where possible, otherwise asked in the questionnaire process

Suggested Approach

What approach should we take?

- Take a hybrid approach:
  - **Online survey by e-mail invitation (reach out to full sample list available for this research – response rate TBD – estimated at n=400)**
    - E-mail survey to customers with possible referral to other contacts
    - Number of surveys will depend on e-mail addresses available and response rates with a focus on providing the opportunity to as many customers as possible to provide feedback
  - **In-depth Interviews by telephone**
    - This qualitative approach will allow for more probing for in-depth feedback and allows us to capture feedback from customers who we do not have email addresses for
    - Consider In-depth Interviews (aim for max. 30 minutes) with randomly selected customers (participants and non-participants) – total number depends on budget, but recommended number is between 25-35 (comprised of previous DSM participants, and non-participants, and representative of all consumption groups, as sample is available)
    - If needed, offer follow-up by telephone to customers who completed the online survey

Customer Groups

- Total consumption is a bigger factor than sub-sector, so we'll group customers by various consumption groups:
  - >10M m^3 (87 premises)
  - 1-10M m^3 (740 premises)
  - <1M m^3 (22,131 premises)
  - Note: total premises is for Legacy Union Gas and Legacy Enbridge Gas Distribution combined. These total numbers would be subject to the 50% sharing with the AMP project.
- Include lists of previous participants and non-participants, with some variation in the questionnaire (~60% the same for the purpose of the quote)

Project Timelines

	Possible Timing
Finalize Project Approach	Early Oct
Final Questionnaire / Discussion Guide	Early Oct
Programming of Survey by Vendor	Mid Oct
Fieldwork by Vendor	**October / November**
SPSS Data File and Tables Delivered by Vendor (for quantitative)	Mid – Late Nov
Report (Top Line)	Mid – Late Nov
Report Final	Late Nov – early Dec

Proposal Requirements

- The proposal should address the following:
  - Understanding of goals and objectives of the research.
  - Vendor recommendations on research methodology and targeted number of completed interviews.
  - Project deliverables.
  - Timelines and milestones, including detailed timelines for providing data and cross-tabs to EGI.
  - Cost estimates based on the number of interviews planned and interview length. In the proposal, please provide a separate cost for each element of the deliverables. Where possible, please provide the CPI or alternative options for the number of interviews (and associated costs).
  - Identification of project liaison for day-to-day contact and other key personnel who will be working on the project.
  - Identification of any potential conflict(s) of interest.
  - Confirmation of agreement with Enbridge Gas Inc.'s general terms and conditions.

Project award is subject to the successful completion of the TRA (Threat Risk Assessment).

Number of Customers

	EGD	UG	Grand Total
COMMERCIAL	**928**	**713**	**1,641**
COLLEGE AND UNIVERSITY	686	466	1,152
HOSPITAL	242	247	489
INDUSTRIAL	**12,633**	**10,791**	**23,424**
AGRICULTURE AND GREENHOUSE	964	3,315	4,279
ASPHALT PAVING AND ROOFING MATERIALS	73		73
CHEMICAL	433		433
CHEMICAL AND PHARMACEUTICAL		211	211
CONCRETE GYPSUM AND PLASTER CATEGORIES - CEMENT	182		182
CONSUMERS GOODS AND NON-METALLIC MANUFACTURING	3,570		3,570
FABRICATED METALS	1,271	364	1,635
FOOD, BEVERAGES AND KINDRED PRODUCTS	942	928	1,870
GENERAL		4,001	4,001
MINING, QUARRYING, OIL AND GAS EXTRACTION	60	81	141
OTHER INDUSTRIAL	2,640		2,640
PETROLEUM REFINING	40		40
PHARMACEUTICAL	129		129
PRIMARY METALS	243		243
PULP AND PAPER	353	567	920
STEEL GLASS IRON FOUNDRY ALUMIN		1,324	1,324
STONE, CLAY, GLASS, AND CONCRETE PRODUCTS	244		244
TRANSPORTATION EQUIPMENT AND MACHINERY	1,489		1,489

Previous Research

What has worked in the past?

Previous Research	Approach	Comments
2017 Customer Engagement – IR filing (Union)	Online workbook	Done by Innovative
Net-to-Gross Study for Custom Programs (Union and Enbridge)	IDIs – includes both Vendor and Customer interviews	Done by DNV GL and ITRON
2011 Custom Communication Evaluation (Union)	3 Focus Groups (Brantford, Burlington, Chatham) with account/project managers (UG employees) PLUS 4 executive telephone interviews (also with UG employees)	Work is done internally with L-UG account managers
2016 Non-Contract Industrial DSM Marketing and Equipment Research (Union)	Telephone interviews with 809 non-contract industrial customers – separately included Food Services, Multi-family, Institutions, Office, Retail and Long-term Health Care	TNS / Leger
2018 Contract Customer Satisfaction Study (Union)	Total of 206 telephone interviews conducted with Strat, Power, Greenhouse and LCII customers	NRG Research, fielded in Sept 2018
2017 Contract Customer IDI – DSM	Total of 26 in-depth interviews with current DSM participants and non-participants	Completed by Insights Matter
2009 Program Design (Enbridge)	One focus group discussion (Toronto) with Small/Medium Gas Load Customers, one with Large Gas Load Customers. 22 in-depth interviews conducted- targeting non-users (or lapsed users) of programs.	Market Optics
2012 Stakeholder Engagement (Enbridge)	12 In-depth interviews with largest industrial consumers (16 were invited to participate) – with senior financial and operational managers, energy engineers, energy/environmental specialists	Ipsos
2011 Customer Feedback Research on Educational Media (Enbridge)	156 CATI interviews were completed – with mid-management, energy managers, process or project managers, technical staff, and maintenance and operations staff	Quadra Research
2012 Qualitative Research Study	Interviews with End Use Customers (2 focus groups with 4-6 participants), also completed with Engineers, Contractors and Equipment Manufacturers	Ipsos

From: Gesiena Antuma
Sent: Thursday, September 19, 2019 5:12 PM
To: martin.hrobsky@ipsos.com
Cc: Karen Sweet <ksweet@uniongas.com>
Subject: EGI - Next Gen Industrial Research

Hi Martin,

Along with the AMP Customer Engagement Research this fall we also want to reach out to our Industrial (and some Institutional) to talk about our Next Gen DSM plan. This would be part of our Next Gen filing to the OEB at some point as well, so the experience and expertise you have with this Customer Engagement process is good!

In this research we'd like to talk to customers who have and have not participated in our DSM programs/offerings in the past and talk about what they'd like to see in the future. Between this research and the AMP we will be sharing our lists of Industrial customers so that there is not too much overlap in contacts (if any). In the attached we're proposing to do online research with a series of more In-depth Interviews for more detailed feedback. It is hard to say what the response rates would be, but our stakeholders will engage customers as best as they can with pre-notifications, etc. in an effort to make this as successful as possible.

Please have a look and provide a quote and thoughts for this work. I'll be out of the office until Oct 1st, during which time Karen might be able to answer any questions, or I'll provide feedback when I get back. We can also talk about it further at our upcoming meeting. We do also appreciate your recommendations beyond what is specified in the document, so please don't hesitate to share those.

Thanks,
Gesiena

Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

"Next Gen DSM – Industrial Customer Engagement – RFQ.pptx" was attached to this email. This document is Attachment 1.

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Tuesday, January 21, 2020 9:05 AM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: EGI - Next Gen Industrial Research

CAUTION: EXTERNAL
Hi Martin,

Are you available to meet this week to discuss this research? We're looking at completing everything by March 31st with both a quantitative (phone and online interviews) and qualitative (IDI) component.

We'll want to get started on writing the survey instruments so that we can get feedback from stakeholders … this will likely take some time, so we'll want to start this process as soon as possible. Does Ipsos want to start with a draft? I probably have some notes to share, what else do you need from us? We can discuss these things.

I am open most of the day tomorrow for a call, or we could set-up a meeting early Thursday (before 11) or after 3. Let me know if that doesn't work and I can look at some options for next week.

Thanks!

Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

From: Gesiena Antuma
Sent: Wednesday, January 22, 2020 5:43 PM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>; Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: EGI - Next Gen Industrial Research

Hi Martin, Lily,

Thank you for your time today.

As discussed, please find attached a couple of things …

1. Some old stakeholder engagement research from EGD that helps to inform some of the topics that will be covered in our research
2. Some slides from our stakeholders with more information about our customer groups, as well as more information about the research objectives (slide 8)

Here are some quick links to information we have on our websites that give you an idea of some of the language we use. Though we're happy to provide more feedback on that.
https://www.uniongas.com/business/save-money-and-energy
https://enbridgesmartsavings.com/business-energy-management

Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

From: Gesiena Antuma
Sent: Wednesday, January 29, 2020 8:38 AM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: EGI - Next Gen Industrial Research

Hi Lily, Martin,

We've met with our team of stakeholders, who are currently working on the list(s) and on providing feedback on the discussion guide. They'll also be providing some more information about the current programs.

We'll split the interviews evenly over L-UG and L-EGD, and have both participants and non-participants, as well as Large and Small customers (determined by volume of natural gas used). The list will reflect that. I believe we will be contacting customers for whom we will have a contact, and will plan to send pre-notifications. Do you have copies of either a pre-notification or a recruitment intro? If not, I think I can adapt the one we used for AMP, but would need some more details for what to say to customers (who will be contacting them?).

Thanks!

Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Thursday, February 20, 2020 4:01 PM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Question

CAUTION: EXTERNAL
Thanks Lily.

I have the two lists of customers that we can use for the research. The team would like to do the interviews as follows.

	Union	Enbridge
Large Participants	~5	~5
Large Non-Participants	~3	~3
Small Participants	~1	~1
Small Non-Participants	~1	~1
	10	10

I can send you the lists using a secure link? When you have a chance to send that to me. And then we can maybe chat about practical next steps on Monday? Do you have availability before 2.30pm? (maybe not 10.30-11).

Thanks,

Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Friday, February 21, 2020 3:54 PM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Question

Hi Lily,

I sent out an invitation for Monday morning, hopefully that time works. Let me know if I should reschedule it. See my responses below.

Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

> **From:** Lily Kim <Lily.Kim@ipsos.com>
> **Sent:** Friday, February 21, 2020 10:15 AM
> **To:** Gesiena Antuma <Gesiena.Antuma@enbridge.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
> **Cc:** Karen Sweet <Karen.Sweet@enbridge.com>
> **Subject:** [External] RE: Question
>
> Hi Gesiena, I'll send you the request link shortly. Just to confirm the approach, a few clarifications:
>
> - These customers have already agreed to participate in the research and no advance letter is being sent? They will be pre-notified. I don't think they'll have agreed, but we can discuss this.
> - They will be aware that Ipsos will be contacting them. Yes.
> - Will they be taken through a screener or has that requirement also been dropped? If so, we will simply be calling to schedule their interview. Hard to say for sure. Let's talk about this, but I think that since we have good contact information we may not need to do the screener separately. Or not all of it.
> - They will not be receiving an honourarium. Correct.
>
> I'm attaching the revised discussion guide – one is a version with a few responses to comments, the other is a clean version – I would suggest having everyone review the latter to ensure flow and order – there are quite a few markups in the original so it may be difficult to follow. Thanks.
>
> In terms of a meeting on Monday, I'm available between 10AM – 2PM, and from 3PM on.
>
> Thanks!
> Lily

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Thursday, February 27, 2020 8:50 AM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Question

CAUTION: EXTERNAL
Hi Lily,

My bad, I took the screener question as a suggested change, made it and sent it out. I did not hear back on the screener from the stakeholders, so we can consider this final, and/or if I made changes that you'd like to revert, I think that will be okay.

If you can send back the final version of the screener and discussion guide then I'll save it for our records.

I'll send you the lists as well. In these lists I have numbered the records so that it is easier to communicate about them. I randomized the lists, and suggested to the teams that we will pre-notify records 1-8 for Large Participants and records 1-3 for Large Non-Participants, then hopefully we'll be able to schedule some of those interviews for review. Then from there we will pre-notify more as necessary. Note that the pre-notifications will happen once we have confirmation from your team on being able to start the calls and a response re: CASL, so there haven't been any notifications yet.

Let me know if you have any questions.

Thanks!

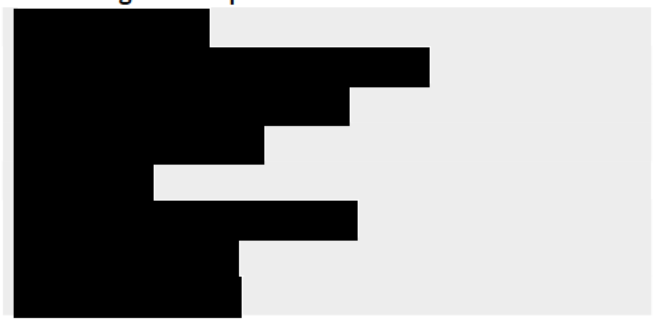
Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Tuesday, March 10, 2020 4:59 PM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Question

CAUTION: EXTERNAL
Thanks Lily.

Could you start tomorrow by calling the Legacy Enbridge Gas customers? Records 1-8 on the Large Participants and Records 1-3 on the Large Non-Participants:

L-EGD Large Participants:



L-EGD Large Non-Participants:

It'll be the same numbered records on the L-UG side, but I don't have 100% confirmation that all have been notified, so I'll check on that.

We're working on signing the 2 documents and will aim to get that to you ASAP.

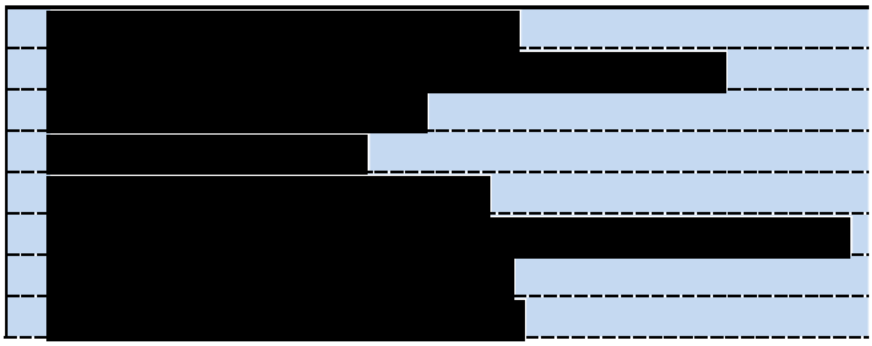
Thanks,

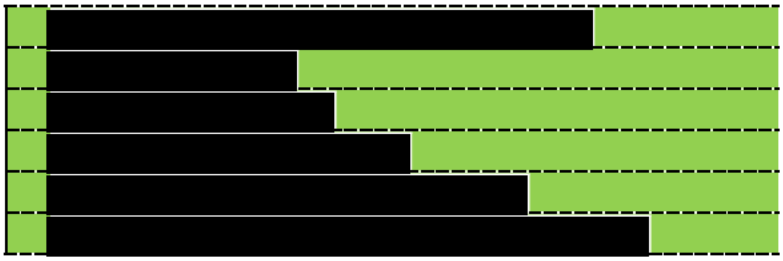
Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

From: Gesiena Antuma
Sent: Wednesday, March 11, 2020 12:19 PM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Question

Thanks Lily.

You can also contact customers from the list below (these are Union). We have a brand new contact at [redacted], so it does not make sense to contact them. We're also in the process of notifying the customers in red, so those should be good to call in the next couple of days. Hopefully not everyone is off next week for March break.





Gesiena Antuma
Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Monday, March 23, 2020 10:08 AM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: Industrial Next Gen - Quantitative Survey

CAUTION: EXTERNAL
Hi Lily, Martin,

As per the original discussions, we'll plan to do an online survey with both small and large customers, manufacturing and agriculture customers, and DSM participants and non-participants following the qualitative work. Or not quite following as we won't have the time to wait after the qual and may have to work on these concurrently. I think it will take us a bit of time to get to a final online survey, but I think we'll want to plan to be done fieldwork by mid-April and complete reporting by the end of April.

To that end, I think we should start discussing the online survey and preparing to field that in April. I would say it takes us back to the original objectives, and would look very similar in content to the discussion guide, though much shorter and more general.

Here is a somewhat tentative timeline. There are of course many uncertainties during this time, but our timelines are still in place so we'll want to push the research work forward as quickly as we can. Do you think you have enough information to work on a draft questionnaire? Or would you like me to send additional material or a draft? Happy to discuss the work order so we keep moving on this work.

Define research goals-customers and business partners	Completed
Determine research methodology	Completed
Develop samples	Portion for Online Survey Due by April 1
Finalize interview guide	Ongoing (complete by March 23)
Conduct customer interviews (in-depth interviews)	Complete by April 3
Update surveys based on interview process	Complete by April 7 (likely not wait for the final IDI report)
Conduct customer survey (online surveys)	Complete by April 17
Provide top-line report	Complete by April 24
Provide final report	Complete by April 30

Thanks,

Gesiena Antuma
Sr. Advisor Market Research
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 | gesiena.antuma@enbridge.com
50 Keil Drive, Chatham, ON N7M 5M1
enbridge.com
Safety. Integrity. Respect.

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Tuesday, March 24, 2020 12:02 PM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>; Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Industrial Next Gen - Quantitative Survey

CAUTION: EXTERNAL
Thanks Martin! It feels like a lot has changed in the last 24 hours, and we agree that the optics of us asking customers to participate in research is a real one to consider. It looks like the list of essential services in Ontario is much longer than most had anticipated, but that being said, many commercial and industrial customers are scrambling and we do not want to suggest that our research is critical at this time.

We will need to do customer engagement and we'll want to be ready to field it when we can. Hopefully soon, but I agree that we'll have to see. It will be good to have the time we need to land on a solid survey … that process always takes longer than we want to, so we'd like to use the time we have now to work on that.

Thanks!
Gesiena

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Tuesday, March 31, 2020 3:34 PM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>; Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Industrial Next Gen - Quantitative Survey

CAUTION: EXTERNAL
Hi Lily,

Thanks for the top line report, it looks great. I think we'll be closing off this portion of the research to focus on the quantitative piece. This means a deep dive would be good to create, and you can take the time needed to do that.

Martin, I'm hoping to book some time to discuss the next phase of the research with the stakeholders sooner rather than later so that we can iron out any remaining details and talk about the quantitative survey. Do you have an approximate timing for the draft questionnaire? I'd like to use the same time to talk about it as well.

Absent any new information we're planning to go ahead with the work for now.

Thanks!

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Wednesday, April 1, 2020 12:49 PM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>; Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Industrial Next Gen - Quantitative Survey

CAUTION: EXTERNAL

I have a meeting from 3.15 to 4.15 today, so could do before or after, but that might be tricky. Tomorrow from 10-11. Or 12-2 would work as well. Earlier tomorrow is probably better because I have an update with stakeholders tomorrow afternoon so could use that time to raise any questions.

I would say that the survey should focus on the list of objectives shared at the beginning of the study, I don't believe that has changed very much as a result of the IDIs. I know there has been lots of edits from the stakeholders around wording, but the topic areas remain the same. Hope that helps!

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Thursday, April 2, 2020 4:15 PM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>; Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: Industrial Next Gen - Quantitative Survey

CAUTION: EXTERNAL
Hi Martin, Lily,

Hot off the press … we will not be doing a quantitative survey this month. It sounds like most customer capital projects are being delayed and customers are not focused on this topic at this time (and so mostly for optics reasons we would prefer not to field at this time). I don't believe it is off the table completely, and that we're more likely to do it later (once some of the crisis fades, though we know the effects will be long-lasting) or do customer engagement at a different stage of the process (in which case the survey content might be a little different, ie. test new program concepts).

The team is very interested in the IDI results, so we would love a deep dive report on that when it is available. I know that 9 IDIs is not a lot, but it will still be useful to our team. We also offered that we could do additional IDIs at any time (with some notice and lead up time of course 😊). Though none at this time. If you have a timeline for the report I can communicate that. I'll share the top line in the meantime.

Thank you so much! Happy to chat for some more detail if you like.

Take care,

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Tuesday, May 19, 2020 4:01 PM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>; Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: 2020 Next Gen DSM Customer Engagement Qualitative Research Full Report v1 (Apr 15)

CAUTION: EXTERNAL
Hi Martin, Lily,

Hope you enjoyed a good long weekend, and have been keeping well!

Our internal stakeholders have been discussing picking this study back up again. While the report to date has been very useful, there is direction from management teams to continue to the work as originally planned to get more solid base size for the Qual, and to start working on a draft of the Quant survey as well. We'll probably want to make some acknowledgement of the current economic circumstances in the discussions and survey, but that will be something with us for a long time.

This would mean scheduling further Qual interviews and drafting the Quant survey.

I'd like to confirm your capacity and availability over the coming weeks, and we can go from there 😊

I'd be happy to schedule a quick call, or answer any questions by e-mail, whichever you prefer!

Thanks!

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 (WFH: 647-455-1533 or Skype)

-------- Original message --------
From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Date: 2020-05-20 1:51 PM (GMT-05:00)
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>, Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: 2020 Next Gen DSM Customer Engagement Qualitative Research Full Report v1 (Apr 15)

CAUTION: EXTERNAL
Thanks for your quick response.

It's great to hear that B2B work is picking back up 😊

For us it is really about picking it back up as soon as is reasonable.

For the qual, we left it at not pre-notifying the next "group" of customers because of covid. We would need to send out further pre-notifications with the knowledge that Ipsos would be able to contact them within several days of sending the pre-notification. I can discuss that with our internal teams, and we'll need a few days to make all those arrangements, but it would be probably good for us to target some dates that would work well for you. Looking at a calendar, we're probably looking at early-mid June to finish the IDIs?

For the quant, we left it at drafting a questionnaire. The group feels that continuing the qual will give us a bit of a feel for how responsive customers will be for the quant. But in the meantime, and really immediately, we can start working on the draft of the questionnaire, because arriving at a final questionnaire to field will probably take some time and back and forth with the stakeholders.

We could do a quick chat tomorrow @9am or 9.30am, or 2pm or 2.30pm. Or any time on Friday. Let me know what would work for you.

Thanks!

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 (WFH: 647-455-1533 or Skype)

From: Gesiena Antuma
Sent: Friday, May 22, 2020 2:53 PM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>; Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: EGI - Industrial Next Gen - continuing the research

Thanks for your time on the call yesterday.

The sales teams have confirmed the request to send out pre-notifications next week and are good with the approach we discussed for the IDIs (i.e. allow for some discussion of covid impacts at the start of the conversation and to allow economic impacts to fall out in the discussion as it is relevant to the questions in the discussion guide). I'll let you know when the pre-notifications have been sent, and for which customers as they come in from the teams.

Hope you have a great weekend!

Regards,

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 (WFH: 647-455-1533 or Skype)

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Monday, June 1, 2020 9:09 AM
To: Martin Hrobsky <Martin.Hrobsky@Ipsos.com>; Lily Kim <Lily.Kim@ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: EGI - Industrial Next Gen - continuing the research

Hi Lily,

The following UG contacts have been pre-notified (further to the L-UG and L-EG ones I had already confirmed). There are some notes from the account managers in there.

This should be lots for now, but do let me know if you need more contacts and we can ask for more prenotifications to go out.

Large Participants:

[redacted]

Large Non-Participants:

[redacted]

If more needed (was next on the list)

[redacted]

[redacted]

Small Participants

[redacted]

Small Non-Participants:

[redacted]

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 (WFH: 647-455-1533 or Skype)

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Thursday, June 11, 2020 10:37 AM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: EGI - Industrial Next Gen - continuing the research

CAUTION: EXTERNAL
Thanks Lily. We'll let you know if we want to pursue another Large Non-Participant for L-UG.

As for the Small Participant, I have confirmation the following have been pre-notified;

[redacted]

Might have one other, but don't have confirmation on the pre-notification yet.

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 (WFH: 647-455-1533 or Skype)

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Thursday, June 11, 2020 11:01 AM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: EGI - Industrial Next Gen - continuing the research

CAUTION: EXTERNAL
One additional pre-notification for that small group:

[redacted]

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 (WFH: 647-455-1533 or Skype)

From: Gesiena Antuma <Gesiena.Antuma@enbridge.com>
Sent: Monday, June 15, 2020 1:43 PM
To: Lily Kim <Lily.Kim@ipsos.com>; Martin Hrobsky <Martin.Hrobsky@Ipsos.com>
Cc: Karen Sweet <Karen.Sweet@enbridge.com>
Subject: RE: EGI - Industrial Next Gen - continuing the research

CAUTION: EXTERNAL
Hi Lily,

Thanks very much.

We did end up notifying more L-UG Large Non-Participants, so let me know if there are any more cancellations and I can send their contact info.

The week of June 29 works for a report (you might get an OOO from us, and I'll probably look at it on the 6th, if that helps to know), I think adding to the current report with recent interviews and any comments and insights that might be new works well. If there is a discussion related to the pandemic, I could see that being added in throughout, or perhaps on a separate slide. I think noting anything because of that would be worth calling out, also as a way to acknowledge that there was a break in the interviewing.

Let me know if you need anything else from us.

Thanks!

Gesiena Antuma
Market Research & Analysis
—
ENBRIDGE GAS INC.
TEL: 519-436-4600 x 5005296 (WFH: 647-455-1533 or Skype)

ENBRIDGE GAS INC.

Answer to Interrogatory from
Association of Power Producers of Ontario (APPrO)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 1, Schedule 6, pp. 3-5
Exhibit E, Tab 4, Schedule 6, pp. 8-9

Preamble:

EGI notes that its Large Volume Program Strategy "builds on the successes and learnings of the existing Large Volume program, with modifications intended to be responsive to customer feedback."

EGI indicates that changes to the Large Volume program include reducing the Large Volume program budget which will decrease DSM related rate impacts in the Rate 100 and T2 large volume rate classes.

EGI indicates that it engaged a number of LVCs and stakeholders to provide an overview of the proposed Direct Access offering. EGI notes that some stakeholders were opposed to paying for DSM programming while others were supportive of increasing funding for the Large Volume program.

Question(s):

a) Please provide the expected rate impacts of the proposed Large Volume program for each rate class.

b) Please provide specific examples of the feedback EGI received, both in favour of the Large Volume Program and against the program. Did the consultation include gas-fired generators (GFGs)? If yes, how many? Please describe their feedback. If no, why not?

c) Please provide all working papers, analysis, and reports written or carried out supporting EGI's decision to reduce the incentive budget and total Direct Access offering budget for the base year and corresponding inflationary increases.

d) Please indicate in what way EGI is increasing the flexibility of the types of projects eligible for the Direct Access offering?

Response

a) Please see Exhibit F, Tab 1, Schedule 3 for the 2023 DSM Budget bill impacts. Enbridge Gas has not prepared rate class allocations based on individual programs.

b) The consultation included GFGs. Enbridge Gas received feedback from two-thirds of the total GFGs that are eligible to participate in the Large Volume DSM program. The high-level Summary feedback from the consultation process can be found in Exhibit E, Tab 4, Schedule 6, pages 7-8. The majority of gas-fired generators were supportive of the amended plan. In addition, Enbridge Gas received formal written support from two gas-fired generation facilities regarding the changes to the program and their eagerness to continue participating. Please see Attachment 1 for the letter of support.

c)

Table 1
Large Volume Program Incentives

Union Rate Zones Rate Class	**2016**	**2017**	**2018**	**2019**	**2020**
T2 South	$2,245,707	$1,689,390	$1,897,903	$2,341,189	$2,133,740
100 North	$195,526	$424,944	$442,996	$343,290	$753,276

The $2.499M incentive budget in 2023 was based on the 5 year (2016 to 2020, see Table 1 above) average historical incentive spend. Enbridge Gas provided the following analysis to IGUA to help their membership understand potential bill impacts.

Rate T2 DSM Allocation

2019 LV Program (Forecast and included in rates)

Component	Total	% of incentive	Unit Rate
LV Program Incentives/Promotion	$ 2,497,889		
LV Program Evaluation	$ 49,958	2%	
LV Program Administration	$ 624,076	25%	
DSM Portfolio Overhead	$ 310,550	12%	
Total LV Program w/overhead	$ 3,482,472		0.0763
Low Income Allocation	$ 1,129,744		0.0248
Total DSM allocation in rates	$ 4,612,216		**0.1011**
2018 DSM deferral and variance account clearances			
Reference EB-2020-07-17, Ex C, T3, Sch 1, Table 7			
DSMIDA	$0		
LRAMVA	($9,315)		
DSMVA	($279,874)		
Total deferral balance	($289,189)		

Rate 100 DSM Allocation

2019 LV Program (Forecast and included in rates)

Component	Total	% of incentive	Unit Rate
LV Program Incentives/Promotion	$ 652,111		
LV Program Evaluation	$ 13,042	2%	
LV Program Administration	$ 162,924	25%	
DSM Portfolio Overhead	$ 81,074	12%	
Total LV Program w/overhead	$ 909,152		0.0892
Low Income Allocation	$ 202,007		0.0198
Total DSM allocation in rates	$ 1,111,159		**0.1090**
2018 DSM deferral and variance account clearances			
Reference EB-2020-07-17, Ex C, T3, Sch 1, Table 7			
DSMIDA	$0		
LRAMVA	($5,007)		
DSMVA	($1,075,320)		
Total deferral balance	($1,080,327)		

Components added Feb 19th

Rate T2 Contract Carriage Service	Current Approved Rates	2019 Forecast Usage	2019 DSM Budget ($000)	2019 DSM Rate (cents/m^3)	Filed: 9/30/2019
Monthly Demand Charge					EB-2018-0305
First 140,870 m^3	32.0198	57,679	1,512	2.6219	Exhibit F1
All Over 140,870 m^3	16.9369	213,647	2,963	1.3868	Tab 2
Interruptible Commodity Charge	1.0043	166,655	137	0.0822	Rate Order
Total Rate T2			**4,612**	**0.1011**	Schedule 10
					Page 4

Rate 100 Large Volume Firm Servic	Current Approved Rates	2019 Forecast Usage	2019 DSM Budget ($000)	2019 DSM Rate (cents/m^3)	Same as above
					Page 2
Delivery Demand Charge	15.0877	41,307	833	2.0175	
Delivery Commodity Charge	0.2199	1,019,625	278	0.0272	
Total Rate 100			**1,111**	**0.109**	

d) As described at Exhibit E, Tab 1, Schedule 6, page 8 of 9, paragraph 26:

> In order to increase customer participation in the Large Volume offering, Enbridge Gas has removed limitations on eligible measures. This modification is responsive in particular to gas fired electricity generators, who have unique equipment which operates sporadically. In order to keep their equipment operating at peak efficiency levels, these customers need to complete expensive maintenance. **The measures being reintroduced include turbine filters, wash and overhauls.** [**Bold** added for emphasis.]

Atura Power

Atura Power Head Office
208-2800 Highpoint Dr.
Milton, ON, L9T 6P4
aturapower.com

March 31, 2021

Andy Duquette
Account Manager
Strategic Power, Distribution Sales
Enbridge
50 Keil Drive North
Chatham, ON N7M 5M1

Re: Demand Side Manage (DSM) Program

Dear Andy,

Halton Hills Generating Station (HHGS) has worked with Enbridge on various DSM projects in 2013. Enbridge has been responsive throughout the process providing guidance to HHGS from project qualification that meet gas consumption efficiencies to funding assessment/reimbursement of approved DSM projects.

Atura would like to support the proposed changes Enbridge is making to its DSM program which include decreasing costs to T2 customers respecting the program and increasing the measures to qualify for DSM projects.

Atura look forward to continuing participation in Enbridge DSM program for its Halton Hills and Brighton Beach Power facilities.

Sincerely,

Noralyn Vasquez
Manager, Contract & Settlements
Atura Power

ENBRIDGE GAS INC.

Answer to Interrogatory from
Association of Power Producers of Ontario (APPrO)

Interrogatory

Issue 10e

Reference:

Exhibit E, Tab 4, Schedule 6, Attachment 3

Preamble:

EGI undertook a customer engagement process on Large Volume DSM and its Next Generation Program.

Question(s):

a) Please provide a copy of all written instructions by EGI in relation to EGI's customer engagement with Large Volume customers DSM and the slide deck provided in Exhibit E, Tab 4, Schedule 6, Attachments 3.

b) Please provide any and all notes from the customer engagement and discussion relating to Large Volume Customers and GFGs

c) Please describe any and all feedback from or related to GFGs.

d) Please provide examples of questions EGI asked stakeholders regarding Large Volume DSM and the Next Generation Program.

Response

a) Enbridge Gas reached out to the Large Volume DSM customers via phone calls or email on an individual basis to set up one-on-one meetings. This included where possible both operations and commercial representatives for customers to enable a more holistic view to provide comprehensive feedback on program design and effectiveness. Enbridge Gas walked through the presentation provided in Exhibit E, Tab 4, Schedule 6, Attachment 3. The process involved providing a brief overview of the current Large Volume DSM program as well as the proposed changes to the Large Volume Program. It also involved soliciting feedback regarding the amended plans. Both the meeting summary and customer input were documented and sent

out for customer review and comment to validate that the customer's input had been captured correctly. The final customer acknowledged meeting summaries are reflected in the high-level summary notes in Exhibit E, Tab 4, Schedule 6, page 7-8.

b) Please see response to Exhibit I.10e.EGI.APPrO.2b

c) Please see response to Exhibit I.10eEGI.APPrO.3b

d) Please see below for the examples of questions Enbridge Gas asked during the engagements.

1) Can you please provide feedback on the current Large Volume DSM program?
2) Can you please provide feedback on the amended plan to reduce the incentive budget?
3) Can you please provide feedback on the amended plan to increase the flexibility of the program?
4) Do you have any other suggestions to improve the program?

ENBRIDGE GAS INC.

Answer to Interrogatory from
Association of Power Producers of Ontario (APPrO)

Interrogatory

Issue 10e

Reference:

Exhibit C, Tab 1, Schedule 1, p. 5
Exhibit E, Tab 1, Schedule 1, pp.1 and 4
Exhibit E, Tab 1, Schedule 4, p. 15
Exhibit E, Tab 1, Schedule 5
Exhibit E, Tab 3, Schedule 1

Preamble:

EGI notes that one of the primary objectives of its DSM plan includes playing "a role in meeting Ontario's greenhouse gas reductions goals". EGI also notes that "all levels of government have made known the desire to reduce [GHG] emissions and have articulated target reductions for both 2030 and 2050."

EGI's Industrial Customer offering seeks to achieve sustained and progressive energy efficiency through a continuous energy improvement approach. EGI notes that one of the Industrial Custom offering's objectives is the reduction of GHG emissions to meet Ontario's reduction goals.

In EGI's 2021 DSM Plan Application proceeding, APPrO noted that GFGs are already incented to find efficiencies and reduce GHG emissions from numerous other regulatory requirements and that numerous climate change, GHG emission reduction and low-carbon fuels policies and programs at all levels of government continue to apply to GFGs. APPrP further noted "that the electricity sector, and clean, natural gas-fired electricity generators therein, appear to be subject to more, stacked, and multiple carbon-related costs than any other sector of the economy."

Question(s):

a) Please provide the rate impact of exempting GFGs from any obligation to contribute to the DSM costs allocated to the LVC rate classes.

b) Please explain and provide details regarding implementing the required changes to EGI's billing system to accommodate exempting GFGs from any obligation to contribute to DSM costs, as contemplated above and detailed in the written submissions of APPrO and the reply submissions on same of EGI in Board File No. EB-2019-0271.

Response

a) Please see Table 1 for the impacts to the Rate T2 and Rate 100 DSM unit rates for 2023 when the GFG billing units are excluded from the derivation of the unit rate.[1] For purposes of this response, 2023 DSM unit rates excluding GFG billing units do not include an allocation DSM low-income to GFG customers.

Table 1
2023 DSM Unit Rates (1)

Line No.	Particulars		2023 DSM Unit Rate Including GFG Billing Units (cents / m³)	2023 DSM Unit Rate Excluding GFG Billing Units (cents / m³)	Increase/ (Decrease) (%)
			(a)	(b)	(c)
	Rate T2 Contract Carriage Service				
1	Monthly Demand Charge				
2	First	140,870 m³	2.6129	3.3888	30%
3	All Over	140,870 m³	1.3821	2.6588	92%
4	Interruptible Commodity Charge		0.0998	0.0998	0%
	Rate 100 Large Volume Firm Service				
5	Delivery Demand Charge		2.0243	2.3382	16%
6	Delivery Commodity Charge		0.0272	0.0309	14%

Notes:
(1) Prepared using 2021 billing units consistent with Exhibit F, Tab 1, Schedule 3.
(2) Prepared based on the approved methodology for determining DSM unit rates for the Union rate zones as prepared in Enbridge Gas's annual rates application.

[1] Derived from allocated 2023 DSM budget costs of $4.783 million for Rate T2 and $1.184 million for Rate 100.

b) Should the OEB consider exempting GFG's from any obligation to contribute to the DSM costs allocated to the T2 and T100 large volume rate classes in the Union rate zone, the Company maintains that it would be necessary for Enbridge Gas to implement changes to its billing system and potentially downstream system and process changes. Some items that would need to be considered are:

- How to separate DSM charges from distribution rates as currently DSM charges are embedded in distribution rates (i.e. they are not specific unit rates billed independently)?
- How to uniquely identify GFG customers in the billing system, and once identified how to exclude GFG customers from DSM charges?
- How to charge DSM charges to all non-GFG customers?
- How to present DSM charges on customer bills?
- Do DSM charges need to be mapped to a separate GL account in EFS (Enterprise Financial Systems)?
- Do rates schedules need to be adjusted to include two sets of unit rates for customers in the same rate class?

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10f

Reference:

Exhibit E, Tab 2, Schedule 1, p.3

Question(s):

Enbridge Gas notes that while the Whole Building P4P offering will initially target schools, it will explore the applicability of expanding the offering to other market segments over the course of the framework.

a) Please discuss which segments of the market Enbridge Gas has considered. In your response, please discuss the key variables that should be similar across a market segment for this program to be successful. Please also discuss the amount of time required to scale this program up and make available more broadly, including implications on overall budget approvals, targets and incentives.

Response

a) Schools were specifically targeted for the introduction of this offering as there have been past pilots and initiatives involving school boards (see Exhibit E, Tab 2, Schedule 1, page 1, paragraph 2), where learnings and feedback have been integrated into the design. It is expected that this segment will be a good entry point for the offering.

   Some of the key characteristics associated with the target market for this offering include the homogenous nature of building archetypes to allow for benchmarking across a portfolio of sites, centralized decision making and control of building operations, highly engaged customers in the achievement of deep savings, and willingness to commit to the offering over multiple years. Based on these characteristics, additional sub-segments within the MUSH sector would be considered as the next potential expansion opportunity. As outlined in Exhibit E, Tab 2, Schedule 4, page 4, paragraph 10, MUSH buildings are highly influenced by provincial, federal and municipal objectives, budgets, guidelines and standards, and

generally have greater acceptance to consider projects with longer payback periods provided doing so supports the achievement of policy goals such as sustainability objectives.

As this new multi-year offering aims to engage and support customers in driving deep savings, it incorporates key elements that differ from the traditional commercial offerings, such as longer customer commitment and back-end performance incentives. It was intended to propose the offering on a smaller scale with an initial target segment of just schools to observe the response from the market before scaling up.

The potential to expand this offering will be assessed at the Mid-Term based on the interim results of the offering. Consideration will be given to various aspects, such as customer enrollment, participant engagement level on the different elements of the offering, and feedback from the market segment/participants.

In terms of scaling up the program more broadly, the current proposed budget and target reflect the assumption that only schools are being targeted. Depending on the size and complexity of building architypes within the next targeted market segment, costs associated with key elements such as modeling and financial incentives could vary greatly. For illustrative purposes however, assuming archetypes targeted for scaling up were similar to schools, it would be expected that the budget and savings targets would scale up proportionally with an increase in participants.

Further exploration of the specific building architypes targeted for expansion would be required to provide a better estimate of the associated budget, target and cost effectiveness. Any budget to fund potential proposed expansion of the P4P offer would be determined at the mid-point assessment in consideration of the budget allocations and targets for 2025-2027.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10f

Reference:

Exhibit E, Tab 2, Schedule 1, p.4

Question(s):

Enbridge Gas notes that any required meter upgrades will be performed to allow for interval metering and monitoring for the Whole Building P4P offering.

a) Please discuss the costs to make these upgrades, who will be responsible for the costs and the funding source should Enbridge Gas bear responsibility for these costs.

Response

a) Enbridge Gas will be responsible for any necessary meter upgrades or retrofits, such as the pulse metering equipment and installations. Average costs for these upgrades are expected to be $3,000. The costs have been incorporated into the program budget.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10f

Reference:

Exhibit E, Tab 2, Schedule 1, p.3-5

Question(s):

a) Please discuss the ways in which participants will be advised to make changes to positively impact their overall energy usage (e.g., equipment upgrades, building retrofits, operational changes, behavioral changes, etc.).

b) Please discuss how Enbridge Gas will work collaboratively to provide a truly whole building opportunity to participants. In your response, discuss what entity will be the primary contact and the logistics of the coordinated effort.

Response

a) The Whole Building P4P offering will provide an avenue for customers to pursue all opportunities for gas savings (behavioural, operational and capital) concurrently, allowing for a comprehensive whole building approach. Historical consumption patterns and building data will be analyzed to identify efficiency opportunities, and key customer stakeholders will be engaged in discussions or workshops to help them understand and prioritize the opportunities. Technical support will be provided throughout the implementation and monitoring phases to help address any capacity and capability barriers. Lastly, the multi-year nature of the offering and back-end incentives promote continuous improvement by monitoring, measuring and rewarding performance year after year. All of the above aspects are intended to help participants achieve deep savings and their performance targets.

b) In an effort to explore collaboration, the IESO and Enbridge Gas have expressed mutual interest to coordinate the existing IESO Energy Performance Program (EPP) with the proposed Whole Building P4P offering and are in preliminary discussions with the objective of coordinating program elements. The primary contact and logistics of any potential coordination have not yet been determined.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10f

Reference:

Exhibit E, Tab 2, Schedule 1, p.7

Question(s):

Enbridge Gas notes that as part of the eligibility criteria for the Whole Building P4P offering, participant sites cannot simultaneously participate in other commercial offerings during the duration of their participation in P4P.

a) Please discuss the process Enbridge Gas will follow to identify and engage the high priority schools that will be the primary target for this offering, including whether this process considers any learnings from the Schools Energy Competition offering in the last DSM term.

b) Please discuss how Enbridge Gas will ensure that these pririty schools do not enter into other commercial offers prior to the P4P launch.

Response

a) Enbridge Gas will leverage benchmarking and energy intensity analysis to identify sites with the highest potential for improvements. While working at the school board level, the sites with the highest potential within the boards portfolio of schools can be identified.

   The proposed design of the Whole Building P4P integrates learning from previous performance-based conservation initiatives and legacy offerings. The approach for Whole Building P4P is to target at the school board level and engage key personnel that are responsible for the operation of the building. This differs from that of the School Energy Competition, which targeted schools and aimed to engage and educate teachers and students directly.

b) Prior to the launch of the Whole Building Pay for Performance offering, Enbridge Gas will actively engage with schoolboards to identify priority schools for the

offering. From there, Enbridge Gas will approach each priority school to promote the offering and secure their commitment to participate. Although Enbridge Gas will make every effort to convince priority schools to commit to participating in the offering, ultimately it will be up to the schools to decide whether or not they would like to participate. Schools that do commit to participate in the Whole Building Pay for Performance offering will not be eligible to participate in other commercial offerings until the end of the pay for performance period.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10f

Reference:

Exhibit E, Tab 2, Schedule 1, p.7

Question(s):

Enbridge Gas outlines the incentive structure of the P4P offering, which includes:

- An annual incentive during the 3-year term of the offer of $0.30/m3 based on M&V incremental gas savings relative to baseline
- An end of term incentive of $0.20/m3 based on M&V of total gas savings at the meter at the end of the offer relative to baseline.

a) Please confirm that there is no incentive cap for participants.

b) Please provide Enbridge Gas's analysis of what the expected average level of incentives paid to each participant.

c) Please confirm that the end of term customer incentive is strictly based on the actual annual reduction on overall gas usage following participation in the program. If this is not correct, please clarify.

Response

a) Based on the proposed Whole Building P4P offering which initially targets schools, there is no incentive cap for participants. Incentive caps may be explored if the offering is expanded to other market segments in the future.

b) If the participant achieves their 20% performance target at the end of the offer, the participant would expect to receive $0.50/$m^3$ saved. Assuming an average annual consumption of 100,000m^3, the participant would be awarded with an incentive of $10,000 if the 20% performance target is achieved at the end of the offering.

c) The end of term customer incentive is strictly based on the actual annual reduction on overall gas usage following participation in the program, determined based on regression models that have been adjusted and normalized for independent variables.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10f

Reference:

Exhibit E, Tab 2, Schedule 1, pp.8-9

Question(s):

Enbridge Gas provides the basis to measure gross savings from the P4P offering.

a) Please discuss how changes to independent variables at each participating school will be factored into the regression model (e.g., pandemic shuts down operations, warmer or cooler weather, more/less occupants, reductions/additions to the overall footprint of the building, etc.), and whether this analysis will reflect evaluation best practice (i.e. IPMVP Option C).

Response

a) The regression model will be derived from metered gas consumption and normalized for independent variables, primarily temperature heating degree days (HDDs). Variables will be used to review the level of accuracy and statistical significance of the regression, which would include, but not limited to, the coefficient of determination (R-squared), and the number of data points to reflect best practices.

   In periods where the data is not representative of typical building operations or there have been changes to the footprint of the building, the baseline model may be adjusted to compensate. The Baseline Period should typically be based on the most recent 12 months of metered data, however alternative periods may be accepted if the most recent data is not representative of typical building operations.

   It is intended that the analysis will closely reflect evaluation best practices in ensuring the statistical significance and accuracy of the regression models and would be subject to review as part of the annual DSM audit process.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10f

Reference:

Exhibit E, Tab 2, Schedule 1, p.10

Question(s):

Enbridge Gas notes that it will be required to make future financial commitments related to participants undertaking activities over the course of their participation in the P4P offering.

a) Please provide Enbridge Gas's analysis of the anticipated total annual deferred participant costs for this offering.

Response

a) Using the 2023 budget as an example, the anticipated deferred costs for the participants that enroll in 2023 across their duration in the offering are shown in the following table. This breakdown assumes that participants will achieve their performance targets with incremental savings across the three Pay-for-Performance periods.

Year	2023	2024	2025	2026
Costs for 2023 enrolled Participants	**$492,500**	**$204,167**	**$204,167**	**$266,667**
Total Whole Building P4P Offering Budget	$1,167,500			
FTE	$54,156			
Total Energy Performance Program	$1,221,656			

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2

Question(s):

Enbridge Gas outlines and discuss the components of its proposed Building Beyond Code Program.

a) Please discuss the necessity of this program considering that government policy is prioritizing more strict building code standards with the goal of net zero buildings within the next decade.

b) Please provide any research materials and analysis produce by or for Enbridge Gas in preparation of its application that quantify the level of missed and lost opportunities by building developers and document the specific areas that remain unaddressed.

c) Please provide any market effects or similar evaluation and/or study that Enbridge Gas conducted to evaluate and quantify the impact of its legacy New Construction programs have had on the building market in Ontario since the beginning of its New Construction programs dating back to 2012. In your response, please discuss and provide supporting documentation that highlights the impact of Enbridge Gas's programs (including legacy UG and EGD) have had on builder practices, the numbers of homes built to the standard of the New Construction programs' homes (both in aggregate and as a percentage of the builder's building stock on an annual basis) both during the years of participation and then following, and any ancillary benefits that have been quantified on non-participating builder's building practices and the number of homes non-participants have built to the standard of the New Construction programs' homes.

d) Please discuss and provide any supporting materials that document the construction cost difference between homes and buildings built to the standards of this program vs OBC requirements.
e) Please discuss and provide any supporting materials that document the sale price difference between homes and buildings built to the standards of this program vs OBC requirements.

Response

a) The implication of these changes to building codes are that as national and provincial codes, and municipal standards continue to evolve towards NZER, the new construction community will be expected to quickly pivot to consider new technological and design approaches necessary to achieve these mandated higher levels of energy efficiency. Enbridge Gas's Building Beyond Code program is designed to support the new construction community in overcoming many of the key barriers to the adoption of the forthcoming higher efficiency standards, as outlined under Exhibit E, Tab 2, Schedule 2, pages 3 to 4, paragraphs 6 to 10.

   Furthermore, the Building Beyond Code program offerings support the progress of the new construction market to build to higher efficiency standards than existing code, thereby reducing lost opportunity to drive efficiencies at the pre-construction phase when there is more flexibility and it is less costly to support envelope, orientation, and system integration design measures.

   Finally, having builders build to above code efficiency levels should result in lower energy costs for owners and occupants of the new building.

b) Enbridge Gas commissioned SeeLine Group Ltd. to conduct a market analysis addressing new construction opportunities in the Commercial New Construction market and Building Knowledge Canada Inc. to conduct a market analysis addressing the residential new construction market. Please see Exhibit E, Tab 2, Schedule 2, Attachments 1 and 2 for full reports.

   In terms of missed and lost opportunities, findings from the reports outline that without intervention, the majority of builders would build to existing code and/or municipal GDS requirements. Therefore, programs that support the adoption of practices and measures that achieve performance levels above code avoid lost opportunities.

   In terms of the residential market, the most significant areas identified to reduce lost opportunities included:

   1. Targeting municipalities with lower adoption rates of ESNH Version 17 building standards, which is roughly equivalent to the achievement of above 20% better than OBC-SB12-17 in an effort to increase ESNH Version 17 building standard adoption rates. Please see response to Exhibit I.10g.EGI.STAFF.69b for additional details.

   2. Increasing the number of builders building to NZER, which represents an over 50% improvement in efficiency relative to SB12 – 17, as outlined in the diagram in Exhibit E, Tab 2, Schedule 2, Attachment 2, page 15. At the time of authoring the plan, there were 24 builders who had built to the CHBA NZER standards since its inception in 2016. The offering aims to support an incremental 20 builders over the first two years of the plan.

From a commercial perspective, primary research conducted by SeeLine Group Ltd. revealed that builders face significant challenges in achieving efficiency performance levels above code, reducing the likelihood of them building above building requirements without intervention.[1]

Participant feedback from the Affordable Housing community also identifies significant financial and technical barriers that would restrict building above code efficiency levels without additional support.[2]

In terms of air tightness testing, an analysis of potential savings that could be achieved through the implementation of air tightness testing requirements involving sixteen modelled commercial, institutional and multi-residential building architypes where it was determined that an additional 31.4% in average annual total energy savings was achievable.[3]

c) Enbridge Gas has not conducted any formal impact evaluation study on its new construction programs, as that is the responsibility of the EAC.

As filed at Exhibit C, Tab 1, Schedule 1, page 29, consistent with the 2015-2020 DSM Framework, the OEB will continue to coordinate impact evaluation and annual verification activities with input from the EAC.

d) In general, it is difficult to land on a specific response to this question as a result of a number of unknowns and variables that change on a project-by-project basis:

- Builders and developers have their own network of suppliers and manufacturers that they work with, which include preferred pricing arrangements that may vary greatly.
- Commercial construction costs will vary significantly based on building archetype and the various measures selected to support the achievement of above code requirements.
- As it relates to multi-residential construction costs, a study conducted by Sustainable Buildings Canada in April 2018 identified that costs become exponentially higher to achieve efficiency performance targets that exceed 15% above existing SB-10. For example, the study revealed that incremental costs associated with implementing efficiency measures in a mid-rise multi-residential building went from an incremental 0.66% to achieve 15% above code, to an incremental 7.15% to achieve 20% above code efficiency levels.[4]

---

[1] SeeLine Group Ltd., Commercial New Construction – Energy Conservation Market and Technologies, Final Report (August 28, 2020), filed in EB-2021-0002, DSM Multi-year Plan and Framework (May 31, 2021), Exhibit E, Tab 2, Schedule 2, Attachment 1, p. 17.

[2] EB-2021-0002, DSM Multi-year Plan and Framework (May 31, 2021), Exhibit E, Tab 2, Schedule 2, pp. 22-23.

[3] Ibid, pp. 27–28.

[4] Sustainable Buildings Canada (SBC), The Evaluation and Costing of the Proposed Energy Star for New Multi-Family Buildings, Program for Ontario (April 11, 2018). https://sbcanada.org/wp-content/uploads/2018/06/ESMFB-Modelling-Project-Report.pdf

- Based on conversations with builders and developers, incremental costs associated with building a home to achieve ESNH Version 17 standards are estimated at approximately $2,000 per home.
- NZER home development in Ontario is still in its infancy, making the establishment of an average incremental cost less predictable. The proposed Residential Savings by Design NZER path will help provide additional insight into costs through the development of NZER model homes.

e) Research was not conducted on sale price differences between homes and buildings built to the standards of this program vs. OBC requirements.

Of note, some of the primary research conducted by SeeLine Group Ltd. and Building Knowledge highlights that perceived value associated with high-performance buildings may be marginal to customers. See excerpts below:

- "The consumer is still illiterate when it comes to how much energy is used in a home and terms like Net Zero have limited impact on decision makers in a household"[5]
- "It is more difficult to rationalize additional investment for condominium developments, and investors will frequently drive the decision ("split incentive"). Unless there is clear evidence that the market will bear the cost differential, it is unlikely for condominiums to move beyond code requirements."[6]

As demonstrated in the excepts above, it is unlikely that the sale price differences on their own between homes and buildings built to the standards of this program will compensate for the incremental costs associated with building to these higher standards. This highlights the importance of the financial, educational and technical support associated with the Building Beyond Code program in motivating and enabling the new construction community to build to higher efficiency levels.

[5] Building Knowledge Canada Inc., Residential Part 9, New Construction: Identifying the opportunities for future DSM programming: Task 1 (Sept. 1, 2020), filed in EB-2021-0002, DSM Multi-year Plan and Framework (May 31, 2021), Exhibit E, Tab 2, Schedule 2, Attachment 2, p. 8.

[6] SeeLine Group Ltd., Commercial New Construction – Energy Conservation Market and Technologies, Final Report (August 28, 2020), filed in EB-2021-0002, DSM Multi-year Plan and Framework (May 31, 2021), Exhibit E, Tab 2, Schedule 2, Attachment 1, p. 17.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2, p. 12-13

Question(s):

Enbridge Gas outlines the Energy Star for New Homes path for the Residential Savings by Design offering and indicates that it will help limit lost opportunities by motivating builders building in eligible municipalities.

a) Please discuss why builders in all regions of the province are not eligible for this path.

b) Please provide a list of eligible (or expected to be eligible) municipalities. In your response, please also provide an accompanying list of ineligible municipalities.

c) Please discuss how builders operating in multiple regions/municipalities will be treated.

Response

a) Energy Star for New Homes ("ESNH") Version 17 has been in market since 2017, and it is with that consideration that Enbridge Gas deemed it more appropriate to focus on municipalities where the penetration for ESNH is falling behind the provincial average.

b) The list below reflects an initial assessment of identified municipalities that would qualify for this offer as of the date of the plan submission (This only includes regions with at least an average of 50 annual new build attachments).

LONDON	NEWMARKET	THORNHILL	MILLBROOK	BRIGHTON
MARKHAM	WATERDOWN	QUINTE WEST	HAMILTON	GRAND VALLEY
RICHMOND HILL	ALLISTON	EMBRUN	TILLSONBURG	PETAWAWA
NEPEAN	ANCASTER	GRIMSBY	WEST LINCOLN	LINDSAY
KANATA	MISSISSAUGA	ROCKLAND	KINGSVILLE	ROCKWOOD
PICKERING	GUELPH	FERGUS	MIDLAND	COBOURG
OSHAWA	FORT ERIE	PELHAM	NEWCASTLE	ORO-MEDONTE
ORLEANS	ST CATHARINES	LAKESHORE	LISTOWEL	STAYNER
BOWMANVILLE	MAPLE	NIAGARA ON THE LAKE	KESWICK	
INNISFIL	BRANTFORD	CUMBERLAND	SPRINGWATER	
THOROLD	WOODSTOCK	STOUFFVILLE	BURLINGTON	
WOODBRIDGE	WINDSOR	TOTTENHAM	SHELBURNE	
NIAGARA FALLS	PETERBOROUGH	ALMONTE	STRATFORD	
STONEY CREEK	GLANBROOK TWP	LASALLE	PORT ELGIN	
BARRIE	BELLEVILLE	GEORGETOWN	SARNIA	
AURORA	ORILLIA	ORANGEVILLE	ARNPRIOR	
CAMBRIDGE	WASAGA BEACH	KEMPTVILLE	LUCAN	
WELLAND	CARLETON PLACE	BEAVERTON	ELMIRA	
AJAX	PARIS	BLUE MOUNTAINS	YARMOUTH TWP	
LINCOLN	CALEDONIA	DUNDALK	PORT DOVER	
BRADFORD	MANOTICK	AMHERSTBURG	CHATHAM	

As filed in Exhibit E, Tab 2, Schedule 2, page 13, a list of eligible municipalities will be developed in the first year of the offering, leveraging internal business intelligence data in conjunction with industry new construction data to establish an ESNH built and verified report (ESNH Report)

c) As filed in Exhibit E, Tab 2, Schedule 2, page 12, builders (inclusive of all subsidiaries) will only be able to participate once per year and receive incentives of up to a maximum of 50 homes built in eligible municipalities.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2, pp. 12-13

Question(s):

Enbridge Gas outlines the details for the Net Zero Energy Ready path for the Residential Savings by Design offering.

a) Please discuss if prospective builders that have participated in past New Construction programs will be eligible for this program.

b) Please clarify the level of incentive a participating builder may receive if participating in the NZER path. In your response, please consider a hypothetical scenario where a participating builder builds 100 homes that meet the program's requirements. Will this builder only be eligible for the $15,000 incentive, or will it be eligible for an incentive of $15,000 for each home it built to the NZER level?

Response

a) As stated in Exhibit E, Tab 2, Schedule 2, page 14, any builder building within the Enbridge Gas franchise territory that has not previously participated in the NZER discovery home path is eligible to participate.

b) As stated in Exhibit E, Tab 2, Schedule 2, page 13, each participating NZER builder will be eligible for discovery home incentive of $15,000 per home. Builders (inclusive of all subsidiaries) will only be able to participate once and receive a single incentive.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2, p.18

Question(s):

Enbridge Gas outlines the details for its proposed Commercial Savings by Design offering.

a) Please discuss and provide a copy of all process evaluations Enbridge Gas (including legacy UG) have conducted in relation to the Residential Savings by Design Program.

Response

Please see response to Exhibit I.5.EGI.STAFF.10a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2, pp. 15-16

Question(s):

Enbridge Gas notes that there is a need for a deferred participant cost mechanism to track financial commitments made to account for future participant obligations due to the multi-year nature of the Residential Savings by Design offering.

a) Please provide Enbridge Gas's analysis of the anticipated total annual deferred participant costs for each offering in this program.

Response

a) There is no anticipated program deferred costs associated with the ESNH path. The NZER path estimates projects can take up to 18 months from the start of builder participation, to the completion of the home build.

   As a result, an estimated annual value of $220,000 associated with these projects will be the anticipated deferred program cost for this offering. See breakdown below:

NZER Builder Support	$	55,000
NZER Discovery Home Incentive	$	150,000
NZER Evaluation Incentive	$	15,000
Total Annual Deferred Program Costs	$	220,000

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2, p.16

Question(s):

Enbridge Gas indicates that over the term of the plan it will explore process evaluations for the Residential Savings by Design program.

a) Please discuss and provide a copy of all process evaluations Enbridge Gas (including legacy UG) have conducted in relation to the Residential Savings by Design Program.

Response

Please see response to Exhibit I.5.EGI.STAFF.10a.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2, p.19

Question(s):

Enbridge Gas proposes a reduction in minimum square footage required for buildings to participate from 50,000 sq. ft to 25,000 sq. ft compared to the current DSM term.

a) Please discuss and provide supporting data that shows how this change will impact the total number of potential builders eligible to enroll in the program.

b) Please discuss the overall natural gas usage difference and potential for efficiency improvements between buildings that are 25,000 sq. ft. vs. those that are 50,000 sq. ft.

Response

a) The former 50,000 square foot and above eligibility requirements restricted participation to larger buildings, leading to an oversubscription of participants from the multi-residential, institutional, and high-rise office building sectors in highly concentrated areas such as the GTA and Ottawa. An analysis of new construction commercial buildings built across Ontario between 2015 to 2020 revealed an incremental 659 buildings that could be accommodated by reducing the minimum square footage threshold to 25,000 square feet and above. This represents an approximate 54 percent increase in new construction buildings that would be eligible to participate in the offering. Furthermore, the analysis revealed, that in some segments, such as those considered “Commercial Properties” based on MPAC property type (i.e. banquet halls, places of worship, retail and office spaces, etc.), reducing the size threshold would increase eligibility within the segment by over 200%.

b) It is important to note that square footage alone is not necessarily indicative of a building's overall natural gas usage. For example, commercial buildings that contain commercial kitchens, on-site laundering and heated swimming pools will have higher natural gas loads per square foot than those that do not.

An analysis was conducted of new commercial buildings 25,000 square feet and above constructed in Ontario between 2015 and 2020. Annual natural gas usage per square footage among these buildings ranged from as high as 10.9 m^3/ft_2, to as low as 0.29 m^3/ft_2, with a mean of approximately 1.18 m^3/ft_2. Table 1 below illustrates the various consumption levels associated with different building size square footage levels to demonstrate overall natural gas usage differences between the 25,000 square foot and above and 50,000 square foot and above thresholds relative to the identified min, max and mean m^3/ft_2 results.

Based on the modeling analysis conducted by SeeLine Group Ltd., it is estimated that building improvements to achieve a 25% improvement over code would result in an average decrease in baseload natural gas consumption of approximately 37% (See Exhibit E, Tab 2, Schedule 2, Attachment 1, page 27, Table 12). A 37% reduction in annual gas consumption was therefore applied in Table 2, to estimate the potential natural gas savings associated with sites that are 25,000 square feet and above versus those that are 50,000 square feet and above relative to the identified min, max and mean m^3/ft_2 results.

Table 1

Annual Natural Gas Consumption			
ft_2	Min m^3	Max m^3	Mean m^3
m^3/ft_2	0.29	10.9	1.18
65,000	18,850	708,500	76,700
50,000	14,500	545,000	59,000
35,000	10,150	381,500	41,300
25,000	7,250	272,500	29,500

Table 2

Estimated Annual Natural Gas Savings (25% above code)			
ft_2	Min m^3	Max m^3	Mean m^3
m^3/ft_2	0.29	10.9	1.18
65,000	6,975	262,145	28,379
50,000	5,365	201,650	21,830
35,000	3,756	141,155	15,281
25,000	2,683	100,825	10,915

As demonstrated in the charts above, natural gas usage and associated savings potential between buildings that are 25,000 square feet and above versus those that are 50,000 square feet and above will vary greatly depending on how natural gas is used in a building. Furthermore, estimated savings are based on annual consumption loads, when considering some of the types of improvement measures that are more likely to be made at the time of construction, such as those impacting building orientation, building envelope and major systems, overall lifetime savings could be exponentially higher.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2, pp. 23

Question(s):

Enbridge Gas discuss the details and various aspect of the Affordable Housing Savings by Design offering.

a) Please discuss the level of overlap between prospective participants (i.e. multi-residential buildings) in the Commercial SBD and Affordable Housing SBD offerings.

b) Please discuss why this offering will only require a 5% increase above Green Development Standards (GDS) targets as opposed to the 10% of the Commercial SBD offer.

Response

a) There is no overlap between prospective Commercial and Affordable Housing Savings by Design ("SBD") participants. If a prospective multi-residential building meets the eligibility criteria outlined in Exhibit E, Tab 2, Schedule 2, page 26, paragraph 82, the prospective building will qualify for the Affordable Housing SBD offering. If a prospective multi-residential building does not qualify for the Affordable Housing SBD offering, however meets the eligibility requirements outlined in Exhibit E, Tab 2, Schedule 2, page 20, paragraph 65, the prospective building would qualify for the Commercial SBD offering.

b) The 5% difference in requirement above GDS targets between Affordable Housing SBD compared to Commercial SBD is due to key differences in market conditions faced by Affordable Housing SBD participants. Affordable Housing New Construction projects are typically more financially constrained, and have challenges in recovering investments made from investing in energy efficient upgrades, whereas Commercial New Construction builds have the option of charging tenants' higher rent or selling the multi-residential building after construction.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10g

Reference:

Exhibit E, Tab 2, Schedule 2, pp. 32

Question(s):

Enbridge Gas discuss the offering details and various aspect of the Commercial Air Tightness Testing offering.

a) Please discuss and provide any supporting documentation for the customer incentives proposed as part of the offering. In your response, please include any studies, interviews or analysis conducted that document the average cost to implement corrective measures to commercial buildings post-construction.

b) Please discuss why this offering will only require a 5% increase above respective GDS targets as opposed to the 10% of the Commercial SBD offer.

Response

a) As outlined in the DSM Plan, Commercial air tightness testing is not widely practiced, and therefore, there is limited knowledge of the costs associated with proper performance testing and deficiency repair.

   Enbridge Gas had conversations with a variety of building scientists from different engineering firms across Ontario to gain perspective on the challenges and potential costs associated with implementing this form of testing. Some of these groups included representatives from SeeLine Group Inc., Building Knowledge, WSP, Purpose Building and EQ Building. Through these conversations, it became apparent that the costs and requirements associated with commercial air tightness testing could vary significantly (ranging anywhere from $5,000 to over $50,000) based on a variety of factors such as building size, number of floors as well as the complexity of the identified deficiencies. The incentives proposed were based on the outcome of these conversations, while being mindful of the overall spend per participant.

As this is a new offering, and there is limited knowledge of costs associated with performing these types of tests, the proposed incentives may need to be adjusted over time to reflect learnings.

b) The Commercial Air Tightness Testing offering is not connected to the overachievement of GDS targets.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10h

Reference:

Exhibit E, Tab 3, Schedule 1, pp. 3-5

Question(s):

Enbridge Gas outlines the details of its proposed Residential Heat Pump offering. Enbridge Gas notes that residential natural gas heat pumps are currently not available in North America and not expected to enter the Ontario market until 2024.

a) Please provide any research Enbridge Gas conducted of similar heat pump programs being offered in other jurisdictions to help inform its proposed offering, including whether they include natural gas heat pumps or not.

b) Please provide any analysis Enbridge Gas conducted in its development of this offering that shows the difference in GHG emissions reductions (both on an average household basis and on a total annual basis using the total projected number of participating households in a year) between installing the proposed natural gas heat pump versus an electric heat pump.

c) Please provide any analysis Enbridge Gas conducted that show the price difference between natural gas heat pump and electric heat pumps.

d) Please confirm that contractors, retailers and manufacturers in Ontario have little to no familiarity or experience with natural gas heat pumps.

e) Please provide greater detail on how Enbridge Gas plans to engage with residential contractors to roll-out this offering.

f) Please provide greater details on the specific incentives that will initially be available to participants.

g) Please explain in what circumstances Enbridge Gas will promote an electric heat pump to a customer as part of this program rather than a natural gas heat pump, and vice versa. In your response, please discuss if Enbridge Gas will examine

cost-effectiveness of installing a natural gas heat pump compared to an electric heat pump for prospective customers.

h) Please discuss how Enbridge Gas will evaluate if a home is a good candidate for a natural gas heat pump?

Response

a) Please see interrogatory response to Exhibit I.9.EGI.STAFF.26a.

b) With the Government of Canada raising Minimum Energy Performance Standards ("MEPS") for heating equipment and introducing market transformation goals for space and water heating, Enbridge Gas has put considerable effort towards advancing heat pump-based solutions so that DSM programming can evolve to meet the future needs of a low carbon economy. In the following, Enbridge Gas will address several interrogatories related to its Residential Low Carbon offering and the rationale for focusing its efforts on hybrid heating and residential gas heat pumps.

To ensure proper comparisons between technologies, it is important to understand the applications for each technology, which informs the appropriate target markets.

Hybrid heating with smart controls replaces the central air conditioner with an electric air source heat pump and upgrades the thermostat. The existing gas heating appliance is intended to stay in place and continue to provide the required peak load heating. The target market is customers with central heating and cooling systems who are replacing air conditioners, and optionally, their heating appliance.

The purpose of smart fuel switching controls is to determine the optimal heating option that can meet the home's heating demand on an hourly basis. This determination is made by a proprietary algorithm that accounts for equipment performance (such as the capacity and efficiency of the heat pump), building characteristics, utility rates, and indoor and outdoor temperatures.

Residential gas heat pumps replace the existing gas forced air home heating system and hot water heater with a single appliance. The target market is customers with central heating and cooling systems who are replacing their furnaces and water heaters.

Electric cold climate heat pumps can be used as part of a hybrid heating solution replacing the air conditioner while keeping the existing furnace to provide peak heating or it can be installed as a full electric heating system that may require an

electric resistance back-up. It can replace the air conditioner or, as part of an all-electric package, replace both the furnace and air conditioner.

A cold climate air source heat pump, on its own, can provide 100% of a home's heating needs provided the potential issues associated with sizing for full load can be addressed. This includes ensuring, as noted in NRCan's Air-Source Heat Pump Sizing and Selection Guide[1], that the air distribution duct systems can provide adequate air flow for homes designed for traditional furnaces and the breaker rating in the main electrical panel is sized appropriately.

Hybrid Heating

Enbridge Gas conducted a study in 2018 with the MaRS Advanced Energy Centre called "Future of Home Heating"[2] to better understand the strategy required in Ontario to address GHG reductions while accounting for affordability and the impacts to the electric distribution grid for residential home heating. The study concluded that hybrid heating is a solution available today that provides homeowners, utilities, and the province a low carbon technology that delivers energy affordability. The report highlighted smart controls as one of the barriers to the deployment of hybrid heating, since smart controls could better balance cost and GHG emissions reductions for homeowner's gas and electric heating sources.

In the MaRS report, hybrid heating and all-electric heating (i.e., a CCHP with an electric resistance back-up) were compared in common residential retrofit and new construction scenarios based on cost, savings, and GHG reductions. The study concluded that a hybrid system has a lower lifecycle energy cost compared to a full electric scenario in a retrofit scenario. The study did not specifically seek out the conditions under which one technology is more cost effective than the other, but rather compared them against the most reasonable baseline conditions, which is how new measures are evaluated in DSM.

In addition, Enbridge Gas has supported NRCan's ongoing research into cold climate heat pumps through a jointly funded study of 7 pilot homes in Ontario. The study was not conclusive but does highlight several market readiness challenges including the training gap with contractors.

---

[1] Natural Resources Canada, CanmetENERGY, Air-Source Heat Pump Sizing and Selection Guide, Version 1.0 (December 21, 2020). https://www.nrcan.gc.ca/sites/nrcan/files/canmetenergy/pdf/ASHP%20Sizing%20and%20Selection%20Guide%20(EN).pdf

[2] MaRS Cleantech and Enbridge, Future of Home Heating (April 2018). https://www.marsdd.com/wp-content/uploads/2019/03/Future-of-Home-Heating.pdf

Since then, Enbridge Gas gained in-field experience with hybrid heating, most recently through an on-going pilot incentive program in London[3]. Enbridge Gas has also contracted with NRCan to develop a home heating calculator that can, among other things, account for the dynamic operation of hybrid heating with smart controls to better model its performance. The tool was developed for Enbridge Gas to estimate operating cost impacts from the installation of a hybrid heating system with smart controls. The tool was developed using NRCan intellectual property and Enbridge Gas was given permission to use the tool for internal business purposes. Enbridge Gas is not allowed to distribute or make the tool available to any third party without the consent from NRCan.

Using the calculator, combined with updated costing information obtained through the pilot program, Enbridge Gas has provided updated lifecycle cost comparisons in Tables 1 and 2 of hybrid heating with smart controls to an all-electric solution. Economics are presented from a customer's perspective.

Key assumptions are as follows:

- Calculations based on 2 archetype homes in Toronto build pre- and post-1980; (an archetype home for Ottawa, which was requested in Exhibit I.10j.EGI.SEC.53, is, regrettably, not yet available in the calculator. A Toronto home, however, is more representative of typical weather conditions for most potential customers).
- For simplicity, utility rates for electricity are held constant at today's rates.[4]
- For simplicity, gas rates are held constant at today's rates, except for carbon pricing, which escalates according to government forecasts ($50 in 2022, escalating $15/year up to $170/ton in 2030 and held constant thereafter).[5]
- The baseline scenario is a 95% AFUE furnace and a 13 SEER, 2 ton, single stage air conditioner.
- The hybrid heating with smart controls scenario assumes the baseline air conditioner is upgraded to a 3 ton, HSPF 10 air source heat pump with smart controls. Common specifications for a cold climate heat pump are used in both the hybrid heating and all-electric scenarios since heat pump pricing varies significantly by make and model. Furthermore, it is assumed that the existing ductwork is adequate for a 1 ton capacity upgrade.
- All-electric scenario assumes the baseline air conditioner is upgraded to a 3 ton HSPF 10 air source heat pump and the baseline furnace is upgraded to an air handler with back-up electric resistance heating.
- NRCan tool calculated and used a -14.3C balance point temperature for the Table 1 scenario and -1.6C balance point temperature for the Table 2 scenario.

[3] Sutherland, Marek, Pilot program encouraging switch to hybrid heating, CTV New London (September 16, 2021). https://london.ctvnews.ca/pilot-program-encouraging-switch-to-hybrid-heating-1.5588436

[4] Rates used are customer rates and not TRC Plus avoided costs.

[5] Ibid.

The difference in balance point is due to different house heat loss. The balance point determines the temperature at which the heat pump is no longer able to meet the heating needs of the home, at which point the backup system is turned on.

- All-electric scenario assumes the furnace and air conditioner are at end of life and need replacing, reducing the incremental cost.
- No electric panel or utility service upgrade is needed to accommodate the all-electric solution. Panel upgrades are estimated to cost between $900 and $2000.
- The installed costs for all scenarios are before tax and has been provided by a London, ON contactor who is experienced with installing heat pump systems.
- 15-year effective useful life (EUL) and a 4% rate was used in the NPV calculation.[6]

Table 1: Post 80's Toronto archetype home

		Air conditioner - end of life Furnace – not at end of life		**Air conditioner - end of life Furnace – end of life**
	Gas furnace – 95% AFUE, 13 SEER air conditioner (base case)	**Hybrid Heating with Smart Controls**	**All electric – CCHP with electric resistance backup**	**All electric – CCHP with electric resistance backup**
Year 2022 Natural Gas consumption (m3)	1,797	1,041	0	0
Year 2022 Electricity Consumption (kWh)	723	3,027	7589	7,589
Year 2022 Operating Costs	$705	$634	$798	$798
Year 2030 Natural Gas consumption (m3)	1,797	221	0	0
Year 2030 Electricity Consumption (kWh)	723	6,532	7,589	7,589
Year 2030 Operating Cost	$1,119	$766	$798	$798

[6] NPV is derived from a customer's perspective and is not the TRC Plus

Installed cost	$8,000	$11,350	$11,100	$11,100
Incremental Cost (compared to base case)	N/A	$3,350	$7,850	$3,100
NPV (compared to base case)	N/A	$-312	$-5,613	$-863

Table 2: Pre 80's Toronto archetype home

		Air conditioner - end of life Furnace – not at end of life		**Air conditioner - end of life Furnace – end of life**
	Gas furnace – 95% AFUE, 13 SEER air conditioner (base case)	**Hybrid Heating with Smart Controls**	**All electric – CCHP with electric resistance backup**	**All electric – CCHP with electric resistance backup**
Year 2022 Natural Gas consumption (m3)	2,236	1,528	0	0
Year 2022 Electricity Consumption (kWh)	844	2,967	11,768	11,768
Yea 2022 Operating Costs	$872	$803	$1,246	$1,246
Year 2030 Natural Gas consumption (m3)	2,236	678	0	0
Year 2030 Electricity Consumption (kWh)	844	7,867	11,768	11,768
Year 2030 Operating Cost	$1,386	$1,145	$1,246	$1,246
Installed cost	$8,000	$11,350	$11,100	$11,100
Incremental Cost (compared to base case)	N/A	$3,350	$7,850	$3,100
NPV (compared to base case)	N/A	$-1,272	$-8,205	$-3,455

An analysis of the results concludes:

- When compared to a common baseline of a gas furnace and air conditioner, the hybrid system has lower lifecycle costs (i.e., a better NPV) than an all-electric solution.
- The all-electric solution, from a NPV perspective, is cost competitive with a hybrid solution in Table 1 because it assumes a best-case scenario:
    - There is adequate ductwork capacity to accommodate an upsized heat pump to minimize reliance on the back-up electric resistance heater. According to NRCan's sizing guideline[7], these circumstances are most predominant in new energy efficient homes or existing homes which have undertaken deep energy retrofits.
    - There is adequate electrical panel capacity. This may not be the case.
    - There is adequate utility capacity to supply additional electricity; peak load for all-electric scenario shifts from typical summer air conditioning peak (~4.4 kW) to a larger winter heating peak (~7.9 kW).

There are important implications when scaling these results:

- Infrastructure impacts: The hybrid solution, unlike the all-electric, does not add to Ontario's winter peak electric load, thereby avoiding the need for the costly expansion of electric infrastructure at scale. The Canadian Gas Association released a report in 2019 entitled "Implications of Policy-Driven Electrification in Canada"[8] that outlines the impacts of different electrification scenarios on power generation requirements, cost and GHG emission reductions in Canada. One of the key assumptions underlying the recommended electrification scenario is the reliance on residential hybrid heating systems instead of all-electric heating systems.

- GHG emissions: The hybrid system would achieve GHG reductions that are comparable to an all-electric solution, based on the appropriate use of marginal emission factors[9] to account for the time-varying nature of grid emissions. Marginal emission factors are lower during off-peak and shoulder seasons versus peak periods when gas-fired generation would be more greatly relied upon. And the IESO has made it clear that these grid realities will not change anytime soon.[10]

---

[7] Natural Resources Canada, CanmetENERGY, Air-Source Heat Pump Sizing and Selection Guide, Version 1.0 (December 21, 2020). https://www.nrcan.gc.ca/sites/nrcan/files/canmetenergy/pdf/ASHP%20Sizing%20and%20Selection%20Guide%20(EN).pdf

[8] ICF, A Canadian Gas Association Study, Implications of Policy-Driven Electrification in Canada (October 2019). Implications-of-Policy-Driven-Electrification-in-Canada-Final-Report-October-2019.pdf (cga.ca)

[9] Marginal Greenhouse Gas Emission Factors for Ontario Electricity Generation and Consumption, Power Advisory LLC, October 2020. Power Advisory LLC (questcanada.org)

[10] IESO, Ontario's Supply Mix, Natural Gas Phase-Out Study, Decarbonization and Ontario's Electricity System (October 7, 2021). Natural Gas Phase-Out Study (ieso.ca)

- Consumer acceptance: Many homes would not satisfy all the conditions for a cost competitive all-electric system because they push up against the boundaries of their existing HVAC and electrical infrastructure. Hybrid heating works within them all. The need for panel upgrades and deep energy retrofits will significantly limit the market potential of the all-electric solution.

Furthermore, home heating with natural gas has approximately 80% penetration in Ontario[11]. The transition to a hybrid system does not require consumers to compromise the familiar comfort of natural gas heating when they need it most. The "Single Family Natural Gas End Use Study"[12] conducted by Enbridge Gas has shown only 3% of customers would choose an electric heating system for their new home heating. This result shows customers are not ready for a full electric heating system. Hybrid heating with smart controls eases consumer acceptance of heat pumps by providing the reassurance of a gas heating system backup as well as the sophistication (through the smart controls) to mitigate concerns about rising heating costs through a switch to electricity.

Conclusion

Hybrid heating with smart controls is a "**ready now**" solution that is accessible to the majority of homeowners and offers greater benefits and significantly less barriers than an all-electric alternative. To meet government 2030 GHG reduction targets, a significant push has to be immediately placed on solutions that are market ready and have the highest likelihood of adoption, particularly in the retrofit market.

Residential Natural Gas Heat Pumps

The Federal government calls out natural gas heat pumps as a key next-generation technology as part of its market transformation road map, in support of the Pan-Canadian Framework on Climate Change. In British Columbia, CleanBC just released the roadmap to 2030 addressing the province's goals to mandate the highest efficiency standards for new space and water heating equipment. The roadmap states that "hybrid electric heat pump gas systems and high-efficiency gas heat pumps"[13] are included in the mix of technologies that will meet the greater than 100% efficiency goal by 2030.
Enbridge Gas has been evaluating residential gas heat pump technology through industry collaboration and through its own pilot projects[14]. Enbridge Gas, in working

[11] Cadmus Group, Ontario Residential End-Use Survey, Final Report (November 28, 2018). https://ieso.ca/-/media/Files/IESO/Document-Library/research/Ontario-Residential-End-Use-Survey.ashx
[12] Filed at Exhibit I.10.EGI.ED.22 Attachment 1.
[13] Province of British Columbia, cleanBC our nature, our power, our future, Roadmap to 2030. https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf
[14] For a summary of Enbridge Gas pilot projects, see Exhibit I.10i.EGI.CCC.40 Attachment 1.

with other utilities, has been supportive of the development and commercialization of gas heat pumps through the North American Gas Heat Pump Collaborative. The Collaborative consists of fourteen natural gas utilities and program administrators as listed below. These organizations represent 31% of US and Canadian households that have gas service with a mission to accelerate the adoption of gas heat pump (GHP) technologies in North America. A common plan to accomplish this is to develop utility programs, supporting manufacturers and trade ally networks, and create common messages and specifications.
Members of the North American Gas Heat Pump Collaborative

- ATCO
- Enbridge Gas Inc.
- FortisBC
- Intermountain Gas Company
- APGA Research Foundation
- National Fuel
- New Jersey Natural Gas
- Northwest Energy Efficiency Alliance
    - Northwest Natural Gas
    - Avista
    - Cascade Natural Gas
    - Puget Sound Energy
    - Energy Trust of Oregon
- ONE Gas
- Peoples Gas & North Shore Gas
- Southern California Gas Company
- Southern Company Gas
    - Atlanta Gas Light
    - Chattanooga Gas
    - Nicor Gas
    - Virginia Natural Gas
- South Jersey Industries
    - Elizabethtown Gas
    - South Jersey Gas
- Spire Energy

Gas heat pumps have the potential to achieve efficiencies beyond 100% with a federal performance goal of a coefficient of performance (COP) of 1.2 by 2030[15]. As a straight gas-for-gas appliance replacement (or two for one in this case), the lifecycle cost comparison to traditional gas appliances is less complicated than in the case of hybrid heating, and an illustrative example of how it compares to the all-electric heating solution is provided in Table 3.

Key assumptions used are as follows:

- Calculations based on a post-80's archetype home in Toronto.
- For simplicity, utility rates for electricity are held constant at today's rates.[16]
- For simplicity, gas rates are held constant at today's rates, except for carbon pricing, which escalates according to government forecasts ($50 in 2022, escalating $15/year up to $170/ton in 2030 and held constant thereafter).[17]
- GHG emissions are calculated from an hourly analysis using marginal emission factors for the province of Ontario.[18]
- The baseline scenario is a 95% AFUE furnace and a .81 UEF water heater
- The gas heat pump upgrade scenario assumes furnace and water heater are replaced with one gas heat pump appliance with 120% seasonal efficiency. This efficiency was used based on DOE's efficiency results[19] on a pre-commercial absorption residential heat pump. The results show a seasonal efficiency of 140% but Enbridge used a more conservative efficiency of 120% to line up with NRCan's 2030 performance goal.
- All-electric scenario assumes the baseline air conditioner is upgraded to a 3 ton HSPF 10 air source heat pump and the baseline furnace is upgraded to an air handler with back-up electric resistance heating.
    - Additionally, no electric panel or service upgrade were included due to varying costs associated with the upgrade. Estimated panel upgrades could be as high as $900-$2000.
    - Existing ductwork was also assumed to be adequate for the upgraded heat pump capacity.
- A heat pump water heater (HPWH) was used in the all-electric scenario. The NRCan tool is unable to calculate the savings from a HPWH so a 50% savings in

[15] Paving the Road to 2030 and Beyond: Market transformation road map for energy efficient equipment in the building sector, p. 32, Figure 4-2. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/2018/en/18-00072-nrcan-road-map-eng.pdf

[16] Rates used are customer rates and not TRC Plus avoided costs.

[17] Ibid.

[18] Marginal Greenhouse Gas Emission Factors for Ontario Electricity Generation and Consumption, Power Advisory LLC, October 2020. Power Advisory LLC (questcanada.org)

[19] Pre-Commercial Scale Up of a Gas Absorption Heat Pump, U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy. https://www.energy.gov/sites/default/files/2019/05/f62/bto-peer-2019-stone-mountain-pre-comm-scale-up.pdf

energy was estimate compared to a conventional electric water heater as per Energy Star's maximum savings potential.[20]

- Electricity consumption in the Gas Heat Pump scenario is estimated to be equal to the base case.
- Gas heat pump costing estimated is provided through manufacturers estimates and installation costs from Enbridge Gas pilot projects
- 15-year EUL and 4% rate was used in the NPV calculation.[21]

Table 3: Post 80's Toronto archetype home

	Gas furnace – 95% AFUE, .81 EF water heater, 13 SEER AC (base case)	**Gas Heat Pump +13 SEER AC**	**All electric – CCHP with electric resistance backup and electric HPWH UEF water heater**
Natural Gas consumption (m3)	2,127	1563	0
Electricity Consumption (kWh)	779	779	9,120
Year 2022 Operating Costs	$828	$630	$998
Year 2030 Operating Costs	$1,316	$990	$998
Annual GHGs	4.81 tC02e	3.75 tC02e	3.9 tC02e
Installed cost	$10,500	$18,250	$17,250
Incremental Cost (compared to base case)	N/A	$7,750	$6,750
NPV (compared to base case)	N/A	$-4,298	$-4,836

An analysis of the results shows the following:

- NPV of the two options is comparable; gas heat pumps have lower operating costs in 2022 but are comparable to the all-electric solution by 2030 due to the rising cost of carbon
- As noted in the hybrid heating lifecycle cost comparisons, the all-electric solution depends on key assumptions that limit its market potential: adequate ductwork capacity, adequate electric service, and adequate LDC capacity for increased demand.
- Peak load for all-electric scenario shifts from typical summer air conditioning peak (~4.4 kW) to a larger winter heating peak (~7.9 kW).

[20] Heat pump water heaters, Government of Canada. https://www.nrcan.gc.ca/energy/products/categories/water-heaters/14556
[21] NPV is derived from a customer's perspective and is not the TRC Plus.

- Gas heat pumps reduce the peak gas load through the efficiency gains at design temperatures and total heating requirements from reducing two appliances to one
- Gas heat pumps achieve comparable GHG emissions reductions as the all-electric solution

When scaling these results, all-electric solutions continue to present the challenges noted in the earlier analysis. Gas heat pumps do not create a requirement for additional infrastructure and, in fact, reduces the load on existing gas infrastructure.

Conclusion

Gas heat pumps are expected to provide significant efficiency improvements over existing natural gas heating equipment, are accessible to a broad range of homes and reduces demand on existing gas infrastructure

c) See response to b).

d) Confirmed. Contractors and retailers have no experience with natural gas heat pumps. Manufacturers are familiar with natural gas heat pumps; however, they are currently not available for purchase in North America.

e) Enbridge Gas is committed to building market capacity and consumer awareness of heat pump technology in Ontario. Although details of this outreach are not fully developed, they will be based on the recent hybrid heat pump pilot launched in London Ontario earlier this year and the learnings from that exercise. An overview of the steps undertaken as part of this unique pilot are listed below to assist the reader in gaining insight into Enbridge's market development activities:

Manufacturers:

- Reached out to 7 major HVAC manufacturers to gauge interest in hybrid heating, and to understand the types of controls available for a hybrid heating solution.
- Educated manufacturers on the NRCan roadmap to 2035, the need for solutions to exceed 100% efficiencies by 2035, and the barriers to overcome to grow the market. Also shared background research to support Hybrid Heating as a low carbon solution. Most manufacturers were not aware of the future changing market conditions and the prominent role that Hybrid Heating provides.
- Submitted to manufacturers a Request For Interest to collaborate with Enbridge Gas to gauge interest to participate in this large-scale pilot program for hybrid heating with smart controls.

- Five manufacturers (Carrier, Daikin, Goodman, Lennox, and Napoleon) expressed interest and entered a Collaboration Agreement with Enbridge Gas.
- As part of the agreement, manufacturers were responsible to bring forward their most knowledgeable heat pump installation contractor(s) to participate in the pilot.

Contractors:

- Contractors were provided Hybrid Heating sales and smart control installation training as part of the eligibility requirements to participate.
- Sales training was specifically developed by Enbridge Gas to provide the necessary knowledge on the features and benefits, and approach to selling a hybrid heating solution to customers.
- ASHP Contractor installation training was made available from the manufacturers, and NRCan conducted industrywide training specific to ASHP Sizing & Selection.

Stakeholders:

- Collaborated with London Hydro and the City of London to support the pilot. Both have shown great interest to support the project and in particular, heightening awareness to residents on the low carbon Hybrid Heating solution.
- TRCA/TAF are working with Enbridge Gas to incorporate learnings from the pilot and to develop a communications campaign for hybrid heating systems in the Greater Toronto Region.
- Consulted with HRAI, NRCan, IESO, LDC, and Municipalities. Opportunity to re-visit HRAI to explore formal Training & Education to support Contractors, and to further heighten consumer and industry awareness.

Marketing & Awareness:

- Created marketing sell sheets for contractors to promote and sell hybrid heating to replace an aging air conditioner with an ASHP
- Produced a media release with City of London and London Hydro which was further broadcasted by CTV[22] and 980 CFPL radio interview.[23]

[22] Sutherland, Marek, Pilot program encouraging switch to hybrid heating, CTV New London (September 16, 2021). https://london.ctvnews.ca/pilot-program-encouraging-switch-to-hybrid-heating-1.5588436

[23] AM980 (CFPL) (September 16, 2021) https://secure-web.cisco.com/1FUFOMx5-Ai260qUjk5R21PIDLWLavukLYB73yOfrwlQbzLnVve84rLXlb_KnKantZ7maK7gbo432Ws9cHujCwzySWtujWU351KHsuBMBBnJML06qnS9VZ2C5fMZDO8ffpPvLTih-_rHfSNhbz-

- Generated targeted email campaign to London customers with hybrid heating offer to drive up participation

Pilot Outcomes:

- Conduct ongoing customer and contractor surveys to test acceptance of a hybrid heating systems throughout the pilot
- Perform M&V on subset of homes with London Hydro as well as TRCA/TAF to analyze data to better understand how hybrid heating impacts overall energy consumption.

f) The following list provides the proposed range of incentive levels for the Low Carbon Transition Program by measure. Incentive levels will be finalized once the program is rolled out. As noted in Exhibit E, Tab 3, Schedule 1, page 4, Enbridge Gas intends to monitor uptake throughout the offering and reevaluate incentive levels as required.

Residential Hybrid Heating: $2,000 - $2,850
Residential Gas Heat Pumps: $5,000 - $7,500
Commercial Gas Heat Pumps: $30,000 - $39,200

g) See response to part b. As identified above, electric heat pumps (through hybrid heating) and gas heat pumps each have a target market that considers the equipment being replaced and the barriers to installation. These factors will inform the decision on which technology is best suited to the installation.

h) Determining if a home is a good candidate for a natural gas heat pump will depend on available outdoor space for the outdoor unit portion of a residential gas heat pump.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10h

Reference:

Exhibit E, Tab 3, Schedule 1, pp. 3

Question(s):

Enbridge Gas notes that although the hybrid system with smart controls proposed as part of this offering is available in other parts of the world, these systems are not currently available in North America for a typical residential application.

a) Please confirm that the technology to install a hybrid system without smart controls is readily available in Ontario (i.e. electric heat pumps), and that the benefits of this system may be achieved by manually switching between an electric heat pump in heating mode and a natural gas heating system (e.g. furnace).
    i. If confirmed, please discuss why Enbridge Gas has proposed this program that is entirely focused on natural gas heat pumps when they won't be available for several years, compared to hybrid heating systems which are currently viable solutions.

b) Please provide any risk analysis conducted by Enbridge Gas that investigates any potential supply and/or availability issues related to the proposed hybrid system controls.

Response

Clarification on the question. Enbridge Gas notes in the Plan that only residential gas heat pumps are not available in North America. Hybrid heating with smart controls are available and currently commercialized in Ontario.

a) Enbridge Gas confirms that the technology to install a hybrid system without smart controls (i.e., electric air source heat pumps and gas furnaces) are available and commercialized in Ontario. Enbridge Gas also confirms that if a customer had the knowledge of which heating system is most cost effective each hour of the day, they

can benefit from the manually switching between the electric heating and natural gas heating modes every hour, resulting in the same gas savings as a hybrid system that is automatically controlled through smart fuel switching.

i. The residential portion of the Low Carbon Transition Program is not solely focused on natural gas heat pumps. In 2023 the program will only be available for hybrid heating which is currently commercialized while in 2024 it will focus on both hybrid heating and gas heat pumps.

b) Enbridge Gas is aware of other HVAC equipment manufacturers who are currently developing smart fuel switching controls; therefore, there are no anticipated supply issues. Additionally, air source heat pumps are widely available from all major manufacturers, so Enbridge Gas does not anticipate any supply issues with heat pumps.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10h

Reference:

Exhibit E, Tab 3, Schedule 1, pp. 4

Question(s):

Enbridge Gas notes that it intends to monitor uptake throughout the residential heat pump offering and reevaluate incentive levels as required.

a) Please provide more detail on the process Enbridge Gas will use to "monitor uptake", when it will re-evaluate the incentive levels, what alternative incentive levels may be provided and the impact of alternative incentive levels will have on the overall program budget and cost-effectiveness, if any.

Response

a) Enbridge Gas plans to monitor uptake by collecting cost information to trend average pricing and gathering feedback from participating contractors on what consumers are willing to pay. As indicated in the response Exhibit I.10h.EGI.STAFF.77f, Enbridge Gas has proposed estimated incentive ranges. The impact of lowering incentive levels will be to fund a higher number of installations with the overall budget (and vice-versa).

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10h

Reference:

Exhibit E, Tab 3, Schedule 1, pp. 5

Question(s):

Enbridge Gas has proposed two metrics for this offering:

- Number of homeowner installations completed by participating contractors
- Number of residential contractors that successfully complete required sales and installation training and complete at least one project installation.

a) Please discuss why Enbridge Gas choose to focus its metrics on contractors as opposed to homeowners/participants, natural gas savings, and/or GHG reductions.

Response

a) Enbridge Gas chose to focus one metric on homeowners and one on contractors because the Low Carbon Transition Program is "designed to support the plans of the federal government to bring low carbon technologies to market" as noted in Exhibit E, Tab 3, Schedule 1, page 1. The intent is to reduce commercial barriers preventing the adoption of lower carbon solutions. Education, training and awareness of participants and contractors is a critical starting point to increasing market acceptance of these new technologies. A focus on natural gas savings and/or GHG reductions would not focus the required attention on removing these commercial barriers.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board (STAFF)

Interrogatory

Issue 10h

Reference:

Exhibit E, Tab 3, Schedule 1, pp. 6

Question(s):

Enbridge Gas noted that it will explore process evaluation topics based on the evolving needs of the offering.

a) Please discuss why Enbridge Gas did not propose a process evaluation plan with this new offering to ensure that the offering is being delivered as intended, is being received by the market as intended, is understood by the target market and is generally producing the results that were expected.

Response

a) Please see the response to Exhibit I.10a.EGI.STAFF.38.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Anwaatin Inc. (Anwaatin)

Interrogatory

Issue 10i

Reference:

Updated Application, Exhibit E, Tab 1, Schedule 3, pages 3 – 13
Updated Application, Exhibit E, Tab 4, Schedule 6, Attachment 1, page 4

Question(s):

Preamble: EGI's Low Income Program includes the Home Winterproofing (HWP) and Affordable Housing Multi-Residential offerings. EGI indicates that one of the target markets for the HWP offering is "[r]esidents of on-reserve First Nations communities who meet income qualification and eligibility criteria." EGI states that it "works with community-based organizations to promote and deliver the offering and leverages municipalities and associations active in the community to raise awareness" and that it consulted with "several familiar stakeholders".

EGI's DSM Stakeholder Update provides that "Indigenous Single Family homes on and off-Reserve" will be eligible for the HWP offer. (emphasis added)

EGI also notes that First Nations communities are "hard to reach" and "require tailored customer outreach".

a) Please file any and all analysis EGI has performed in connection with the number of on-reserve and off-reserve First Nation residents that have made use of the HWP offering. If EGI has not undertaken any such analysis, please provide estimates and explain why no such analysis was performed.

b) Please file any and all analysis EGI has performed in deciding to extend eligibility of the HWP to Indigenous single family homes on- and off-reserve.

c) How does EGI propose to monitor and report on the effectiveness of its Low Income Program for Indigenous customers? Please provide an example or examples.

d) Please file any and all analysis EGI has performed in connection with Indigenous -owned or -occupied multi-residential housing that is eligible for the Affordable

Housing Multi-Residential offering. If EGI has not undertaken such analysis, please provide estimates and explain why no such analysis was performed.

e) Please provide details of EGI's "tailored customer outreach" for Indigenous customers as it relates to the Low Income Program and the Indigenous organizations it works with to promote and deliver the offerings.

f) Please indicate which of the "familiar stakeholders" were Indigenous stakeholders (individuals, First Nations, Indigenous-owned businesses, etc.) that EGI consulted with in preparing the Application as it relates to the Low Income Program. If not, please explain why none of the stakeholders were Indigenous stakeholders.

Response:

a) Please see response to Exhibit I.10b.EGI.STAFF.41b for on-reserve First Nation residents.

Enbridge Gas does not currently track off-reserve First Nation residents, as these off-reserve individuals would have to self-identify as Indigenous. Accordingly, Enbridge Gas has not identified and tracked Indigenous off-reserve participants to date. Enbridge Gas is currently working on an off-reserve strategy and will review if and how off-reserve participants can be tracked and reported at a high level while adhering to privacy legislation.

b) No formal analysis was completed as no changes have been made to eligibility in the proposed plan. As discussed in Exhibit I.10.EGI.OSEA.3b, the plan only proposes to serve on-reserve Indigenous customers through its existing Home Winterproofing offering. The current HWP offering can continue to support a customized on-reserve outreach and approach to market while providing flexibility to add new DSM measures with specific eligibility for on-reserve homes, as indicated in Exhibit E, Tab 1, Schedule 3, page 11.

For the current residential eligibility criteria for on-reserve, please see the 2015-2020 DSM Plan proceeding (EB-2015-0029), filed by Union Gas Limited ("Union") on April 1, 2015, in Exhibit A, Tab 3, Appendix A, pages 77 to 80.

For the current eligibility for off-reserve, please see HWP eligibility in the 2015-2020 DSM Plan proceedings:

- EB-2015-0029, Union 2015-2020 DSM Plan (April 1, 2015), Exhibit A, Tab 3, Appendix A, pages. 74-75.
- EB-2015-0049, EGD 2015-2020 DSM Plan (April 1, 2015), Exhibit B, Tab 2, Schedule 1, page. 44.

Historically, on-reserve Indigenous residential support has been a sub-segment of the main HWP offering. Enbridge Gas is able to continue to support on-reserve Indigenous homes within the HWP offering, using unique outreach strategies. Enbridge Gas is also able to adjust the Indigenous HWP focus to off-reserve homes and develop unique strategies to reach this sub-segment of the market. Enbridge Gas will leverage the lessons learned, outreach ideas and marketing material used for Indigenous on-reserve support, and determine the best way to apply to off-reserve homes. Conversations for this off-reserve outreach have only recently been initiated, and Enbridge Gas will continue to tailor the approach, based on the needs of the market.

c) Enbridge Gas will continue to monitor various information, such as the following for Indigenous on-reserve HWP: the number of on-reserve gas communities, the communities entered, communities outstanding, homes served and lessons learned. As mentioned above, Enbridge Gas does not currently track Indigenous off-reserve progress. Indigenous on-reserve Multi-Residential progress will be monitored as well. Reporting will be provided in the annual report.

d) Enbridge Gas has not performed any formal analysis in connection with Indigenous -owned or -occupied multi-residential housing. Enbridge Gas will further explore this opportunity, which will include exploring potential collaboration with the IESO CDM Indigenous Commercial offer that has not been released. Please see response to Exhibit I.16.EGI.STAFF.86h.

e) Please see response to Exhibit I.10b.EGI.STAFF.41b and c.

f) Please see response to Exhibit I.17.EGI.Anwaatin.5a and d.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Consumers Council of Canada (CCC)

Interrogatory

Issue 10i

Reference:

Exhibit E, Tab 3, Schedule 1, page 3

Question(s):

Please provide the cost-effectiveness screening for the Residential Heat Pump Program Offering. Please explain why the OEB should approve a program offering at this time when the technology is currently not available in North America. Why should the OEB approve a program that will not be subject to impact evaluation and verification?

Response:

Cost effectiveness screening is found in the response to Exhibit I.10.EGI.ED.36b. The Residential Low Carbon offering includes 2 residential measures, hybrid heating with smart controls and natural gas heat pumps. Currently, hybrid heating with smart controls is available and commercialized in Ontario.

Residential gas heat pumps are not currently available in North America. Three manufacturers, SMTI, ThermoLift, and Vicot, have indicated they will have certified residential gas heat pumps in the Ontario market by 2024 (if not sooner). Please see Attachment 1 for information from an Enbridge Gas June 23, 2021 webinar for further details of Enbridge's research and development activities and vendor product development plans.

Incentive support is important to ensure the successful launch of these products when they enter the North American market and the absence of it could cause a loss of momentum and opportunity. Early incentive support will ultimately accelerate market adoption in support of NRCan's market transformation goals for this technology.

The Low Carbon Transition Program, which includes the residential natural gas heat pump, is positioned as a market transformation activity. At Exhibit C Tab1 Schedule 1 page 16, Enbridge Gas has defined Market Transformation activity as updated from EB 2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for

Natural Gas Distributors. Market transformative programs are not suited to a mechanistic cost-effective screening tool today, however, Enbridge Gas believes that as the commercial barriers are addressed it will become cost effective in the future.

Impact evaluation and verification response is provided in Exhibit I.10j.EGI.SEC.56.

GHP technology readiness for NA market

Green: Commercial sector ready now. Grey: Residential products commercially available by 2023.

Manufacturer	Type	Primary Sectors	Primary Applications	Technology Readiness for North America
ROBUR	Absorption	• Commercial • Residential	• Space heating • DWH heating • Cooling	• Commercial size unit commercially available • Residential unit at lab testing and field trials stage
YANMAR	Engine driven	• Commercial	• Space heating • Space cooling	• Commercially available
SMTI	Absorption	• Residential • Small commercial	• Space heating • DHW heating	• Field trials and pilots underway • Commercially available (2023)
ThermoLift	Thermal compression	• Residential • Small commercial	• Space heating • DHW heating • Cooling	• Lab testing and field trials underway • Commercially available (2023)
VICOT	Absorption	• Commercial • Residential	• Space heating • DHW heating	• Commercially available in China • Lab testing and field trials in NA
Rinnai	Absorption	• Residential	• DHW heating	• Lab testing and field trials planned • Commercially available (2023)
boostHEAT	Thermal compression	• Residential	• Space heating • DHW heating	• Lab testing in NA

Enbridge Gas' GHP commercialization efforts

Commercial demo

ROBUR YANMAR VICOT SMTI

4 demonstration projects completed

- MURB DHW heating: GTA (TAF)
- Heating and cooling: Tweed Library
- Heating and cooling: GTA (TRCA)
- Heating and cooling (2-pipe system): Office building in Woodstock

5 demonstration projects underway

- Simultaneous heating and cooling (3-pipe system): Bakery and a convenience store in GTA
- Two Roof Top Units (RTU) for heating and cooling at an aquatic centre and potentially a store
- MURB DHW with TAF in GTA
- DHW for a kitchen in a long-term health care facility (GTA)

Residential demo

SMTI ThermoLift VICOT Rinnai

- 4 SMTI GHP (Space and DHW heating) field trials completed as part of a GTI consortium
  - One in GTA and 3 in Chicago area
- 2 Thermolift (space heating, cooling and DHW) field trials in Ontario
- 2 Vicot (space and DHW heating) field trials in GTA
- Potential field trials of GHP water heater in GTA

Lab performance testing

VICOT boostHEAT

- Vicot commercial unit
- Vicot residential unit
- boostHEAT residential unit

T&D and Collaborative

- Gas Technology Institute
- North American CHP Collaborative (18 major gas utilities)
- ESC GHP Education Consortium

Enbridge Gas DSM Offering

- Technical and financial support

GTA – Greater Toronto Area

Robur absorption GHP: MURB DHW heating

Description

- First demo of a GHP for a multi-unit residential building (MURB) DHW heating in Canadian climate
  - Building area16,260 m^2, 372 units
- Project jointly developed by gas utilities, The Atmospheric Fund (TAF), and Toronto Community Housing
- Two 125 MBH Robur GHP to supply base DHW (about 58%) with additional heating provided by condensing boilers
- Installation, commissioning and M&V from 2017 to 2018

Results

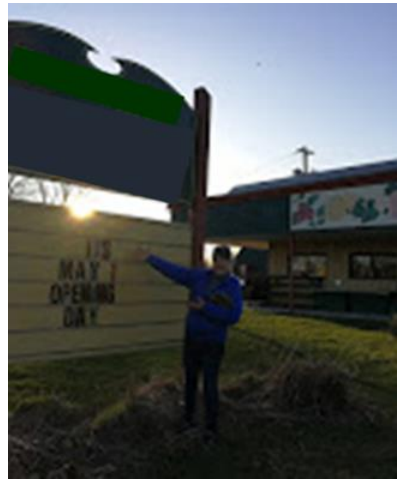
- Mean COP: 1.14
- Annual natural gas saving: 5,390 m^3
- Annual GHG saving: 10.1 tonnes
- Technology proven robust for Ontario Climate.
- Positive results paving the way for GHP DHW heating application in multi-unit residential buildings

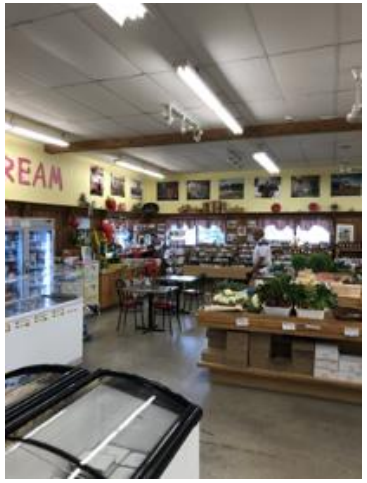
Source: The Atmospheric Fund Gas Absorption Heat Pumps: Technology Assessment And Field Test Findings Report 2018

Yanmar engine driven 3-pipe GHP: Heating and cooling

Description

- A Family Farm market, Bakery and convenience store, 7,700 ft^2, Cobourg, Ontario
- One Yanmar VRF 3-pipe system
  - Heating and cooling at the same time
- 14 TR cooling capacity
- 162,000 Btu/hr heating capacity
- Base case heating and cooling: RTU Package System
- The system was commissioned in February 2020





Results

	Heating	Cooling
Average COP	1.2	1.5
Cost Savings	30%	60%

- The system maintain its high-efficiency performance at part load.

Yanmar engine driven GHP-RTU: Heating and cooling

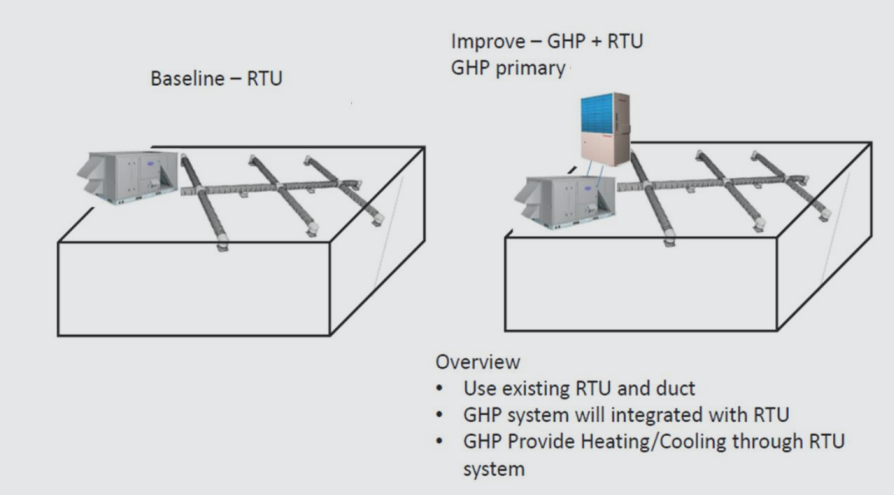
Description

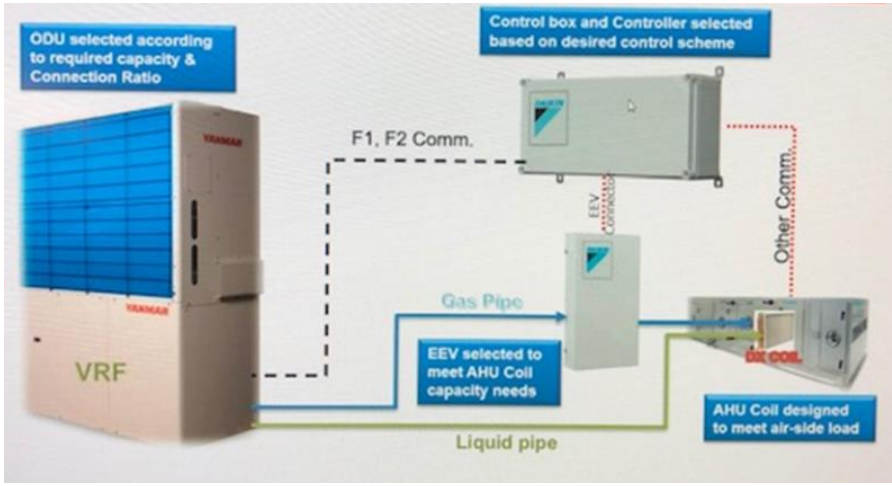
- Two systems, each
  - 14 TR cooling capacity
  - 168,000 Btu/hr heating capacity
- Custom design matching coil for the existing RTU
- The existing RTU units should be a package system with refrigeration coil(s)

Status

- One site selected in London area
- Soliciting second site
- Enbridge covering up to 90% of the project cost to a maximum contribution of $75k

Integration of RTU with GHP

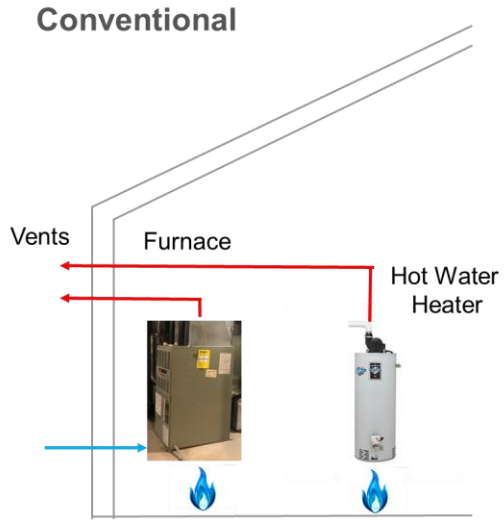


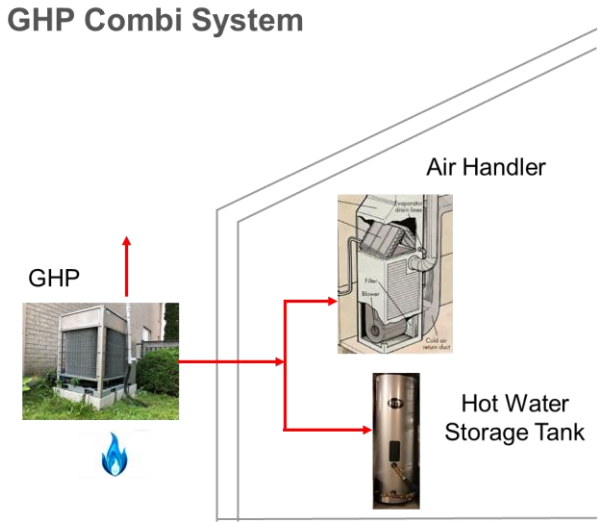


SMTI residential absorption GHP Toronto field trial: Space and DHW heating

Description

- Output: 80,000 Btu/hr, Input: 55,000 Btu/hr
- COP: 1.4 at 47 F ambient and 100 F return water temperature
- One unit installed in Toronto (2020 – 2021)
- Part of a GTI consortium





Results

- Significant lessons learned about the installation and operating practices
- Valuable information gathered to improve the final product
- Reliable operation during 2020 – 2021 heating season, providing thermal comfort and DHW to a family of four
- Preliminary COP results
  - COP: 1.1 – 1.45

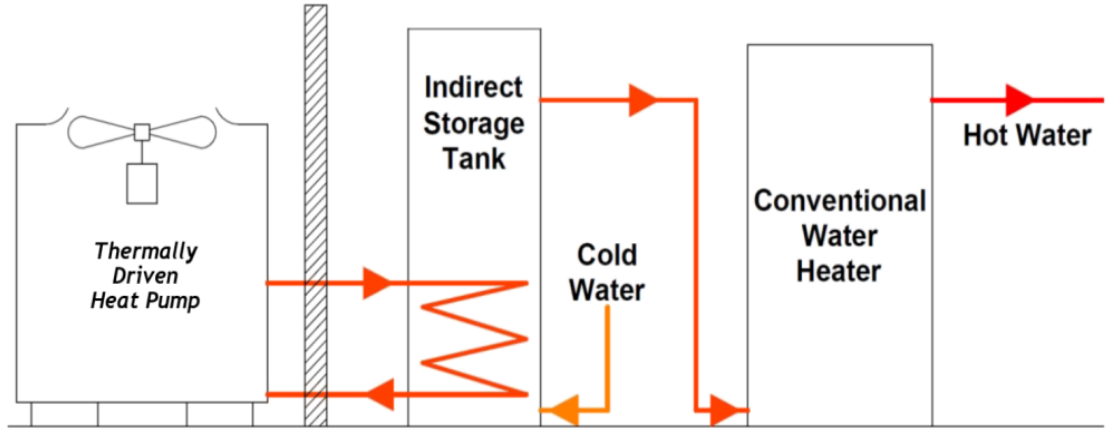
SMTI absorption GHP for small commercial: DHW

Description

- Output: 80,000 Btu/hr , Input: 55,000 Btu/hr
- COP: 1.4 at 47 F ambient and 100 F return water temperature
- Kitchen DHW heating in a long-term health care facility in GTA
- In series with existing water heating tank
- Pre-heating city water for DHW system
- Other applications: Restaurant DHW heating

Status

- Installation start date: Q3, 2021



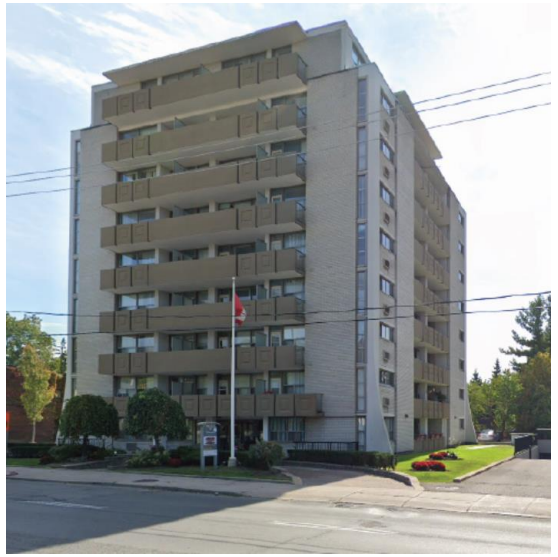
Vicot absorption GHP: MURB DHW heating

Description

- One unit being installed at a MURB in Toronto to supply 100% DHW load
  - 9-storey, 51 apartment units
- First of its kind installation outside of China
- Joint project with TAF
- Nominal heating capacity: 220,000 Btu/hr
- Existing DHW heating system
  - 630,000 Btu/hr boiler
  - 3 x 120 gallon tanks
- Keeping boiler in place for backup

Status

- Installation underway
- Completion Q2 2022



Summary

1. Two GHP products are commercially available now for the commercial sector.
2. Certified residential GHP products expected to be commercially available by early 2023.
3. GHPs offer cost-effective solution for space heating, cooling and domestic hot water heating with efficiencies greater than 100%.
4. GHPs offer a pathway to achieving net-zero emissions by 2050 as gas distribution system is decarbonized with carbon neutral fuels such as renewable natural gas and hydrogen.

Stone Mountain Technologies, Inc.

Comfort for Less

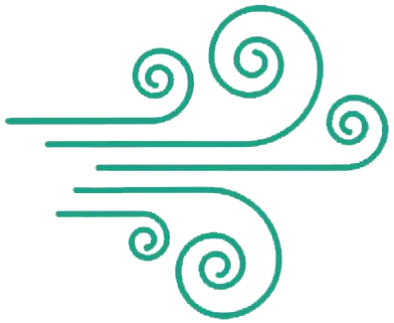
Gas Absorption Heat Pumps

Very High-efficiency / Low-Carbon Building Heat

www.StoneMountainTechnologies.com
www.linkedin.com/company/stone-mountain-technologies-inc./

What is SMTI's Gas Absorption Heat Pump ?

Gas Absorption Heat Pump (GAHP)



Thermal Energy from Air

0.4 Btu

Fuel Source

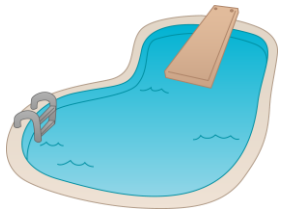
- Natural Gas
- Propane
- Renewable Gas
- Hydrogen
- Fuel Oil/Bio-diesel

1.0 Btu

1.4 Btu Warm Heat

Space Heating

Water Heating



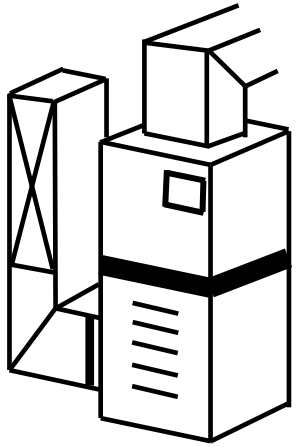
Pool Heating

High efficiencies result from extraction of "free" heat in the air: 30% delivered energy is renewable

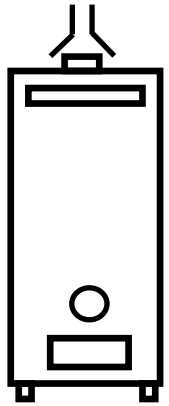
Gas Absorption Heat Pumps

LOWEST COST, LOWEST CARBON

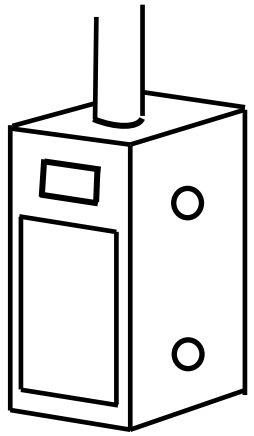
ALTERNATIVE FOR:



GAS FURNACES



WATER HEATERS



GAS BOILERS

annual operating cost and carbon emissions compared to gas and electric heat pump heating systems

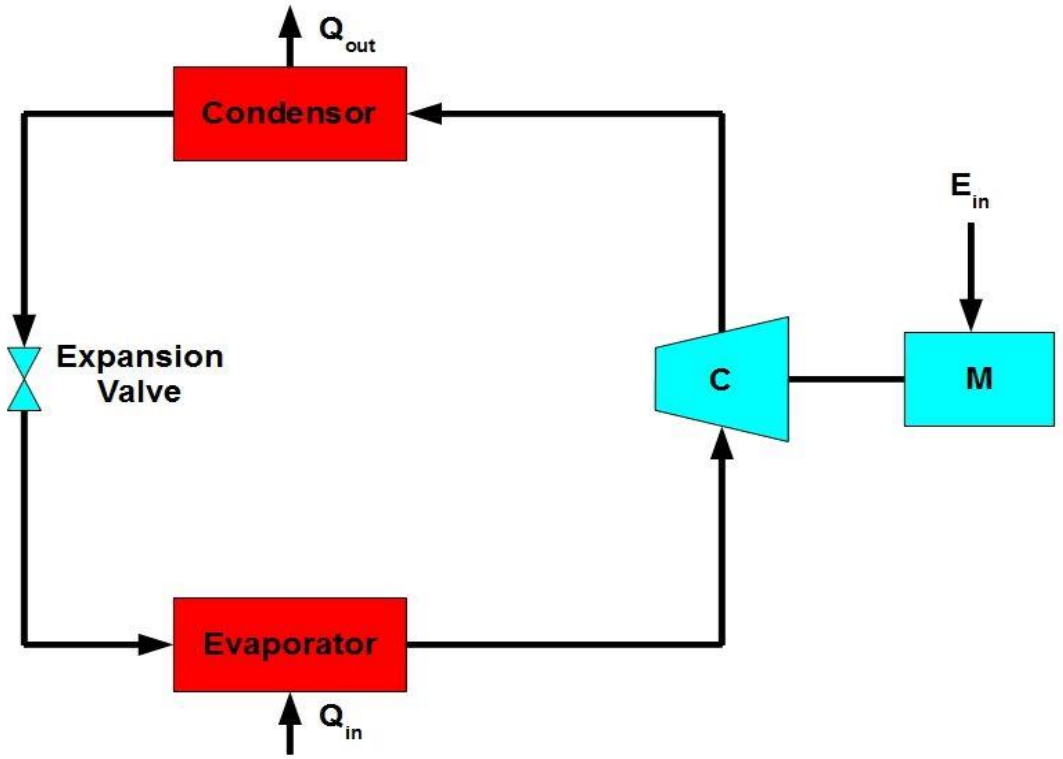
SMTI GAHP General Specifications

Space Heating | Water Heating | Combi

- 10,000 to 140,000 Bth Capacities (3 to 40 kW)
- AFUE: 140%
- COP_{gas} = 1.43*
- Natural gas, propane, renewable gas, *hydrogen (future)*
- Air to Water
- Condensing, 4:1 Modulation
- 115 VAC, less than 5 amps
- NOx Emissions: meets South Coast AQMD
- Refrigerant GWP = 0 (H_2O / NH_3)
- Minimum Ambient Operating Temperature: -40°F (-40°C)
- Maximum Supply Water Temperature: 145°F (63°C)
- All combustion & venting outside

** Standard Rating Points: 47°F (8°C) ambient air, 120°F (49°C) supply water*

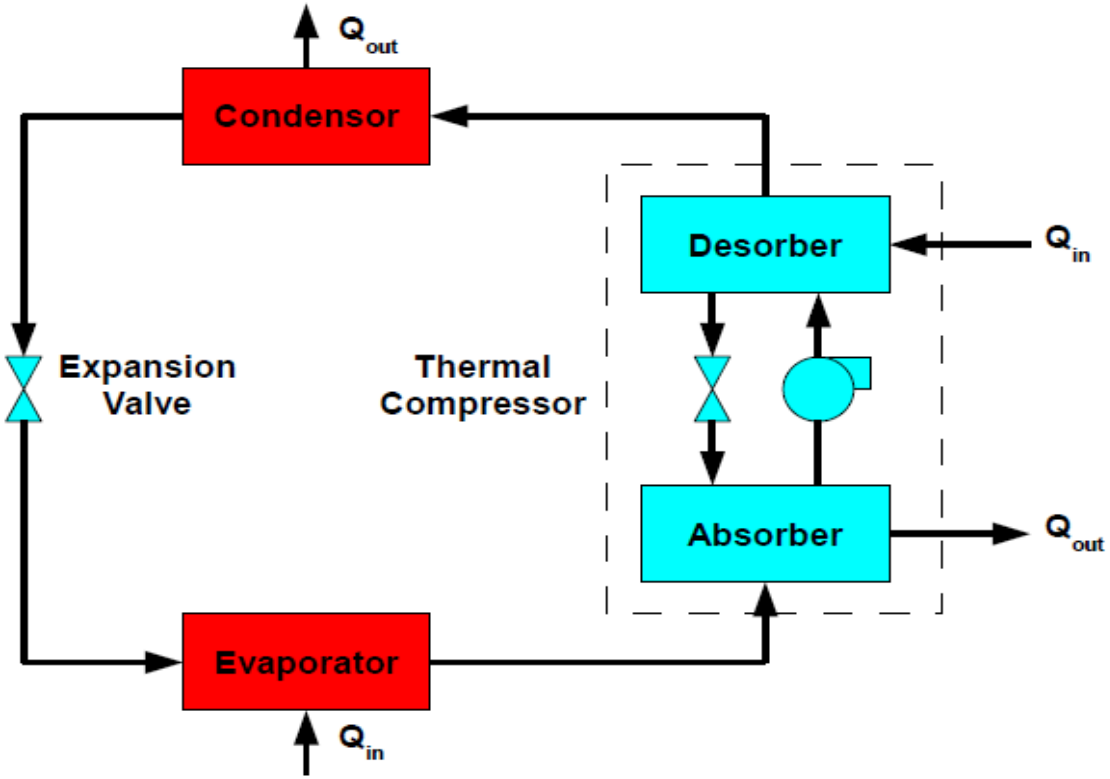
Simplified Cycle Comparison



Vapor Compression

Site Heating COP: 3-4

Q_cool ≈ Q_heat

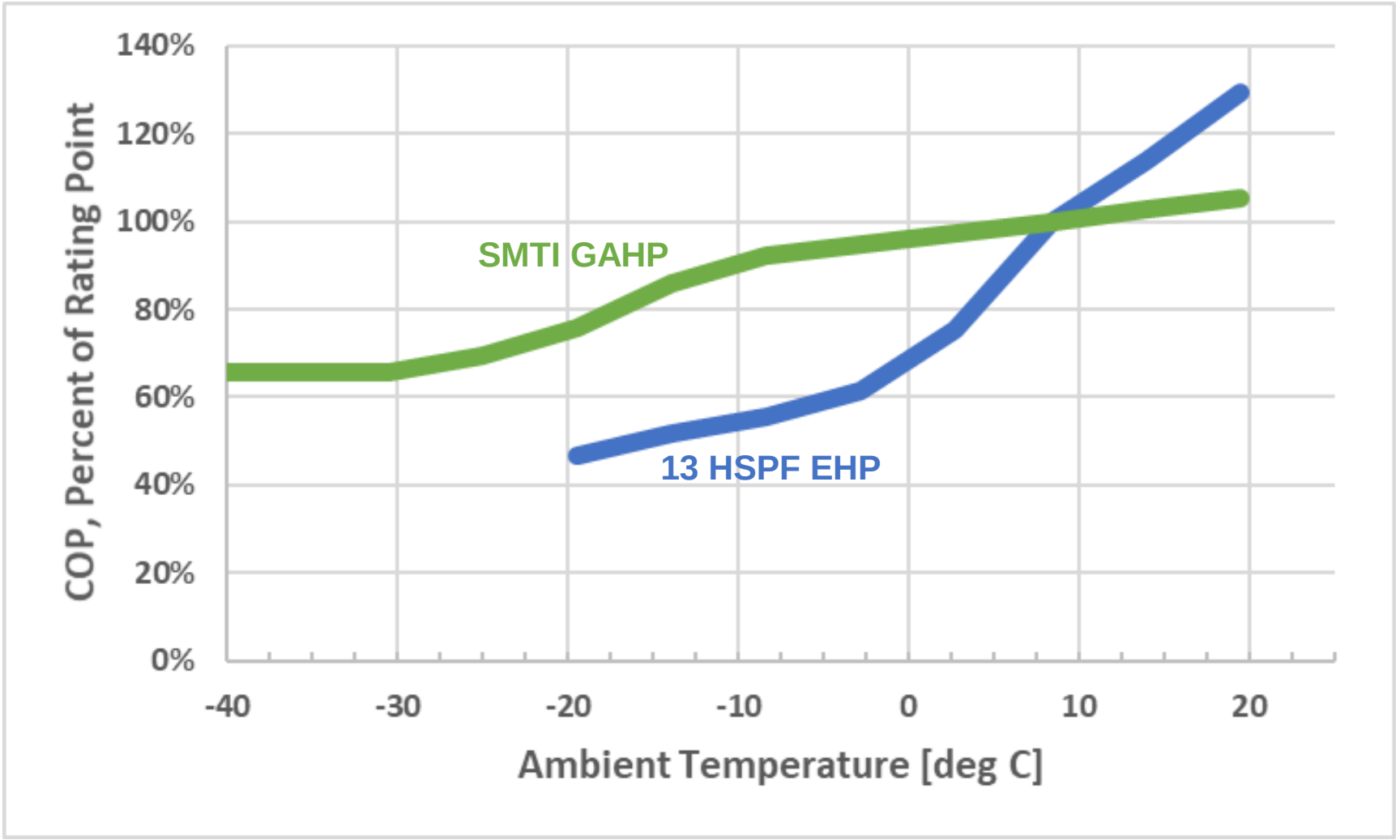


Absorption

Source Heating COP: 1.4 – 2.0

Q_heat = 2.5 Q_cool

Efficiency vs Outdoor Temperature

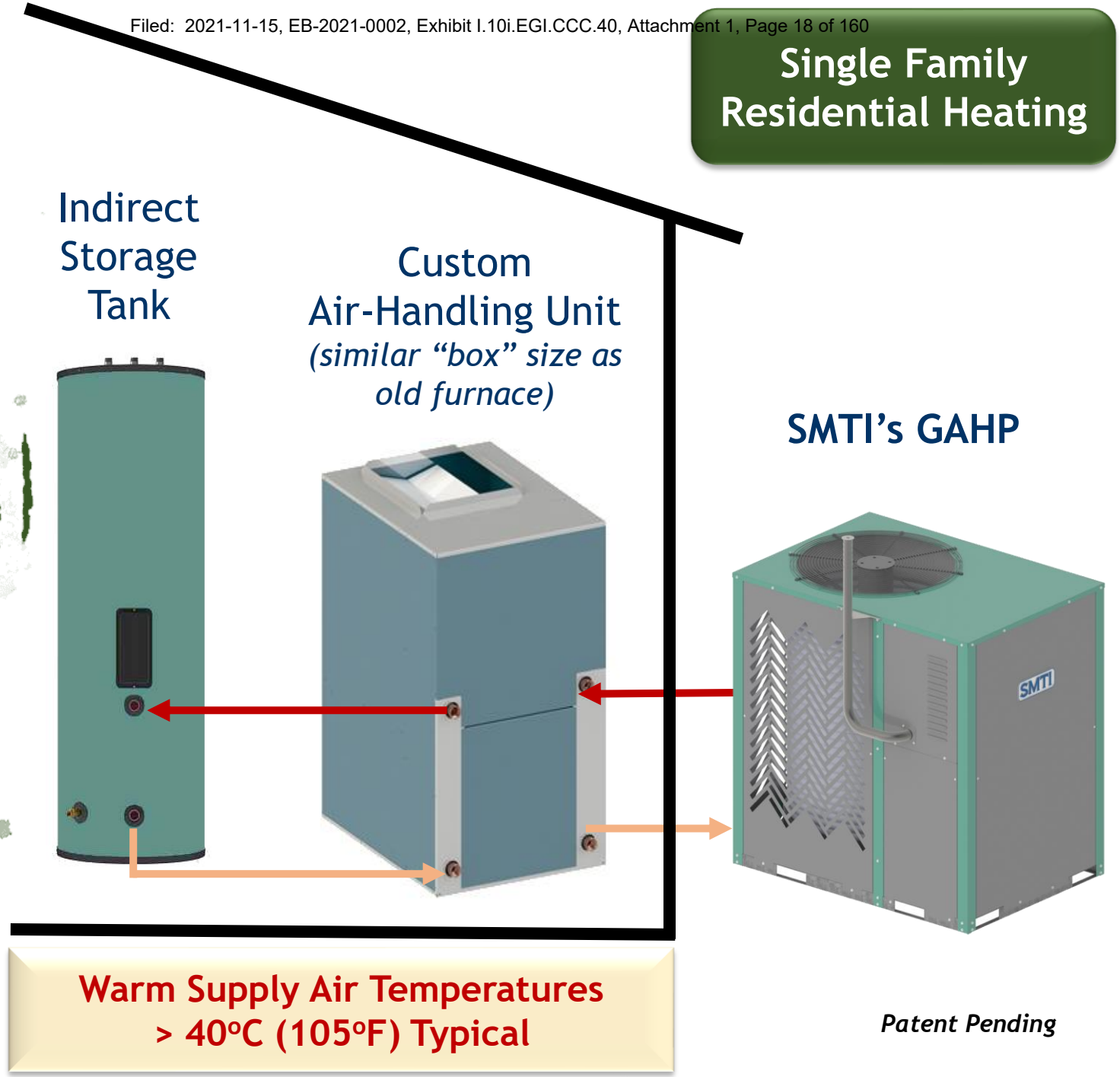


What can a SMTI Gas Absorption Heat Pump be used for?

Furnace Combi-System

Single Family Residential Heating

- ✓ Complete system as a kit replaces gas furnace & water heater
- ✓ AHU is factory-plumbed with hydronic pump and controls
- ✓ Plug-n-play installation
- ✓ DHW easily replaces traditional gas-fired storage tanks or tankless
- ✓ Outside combustion resolves safety and IAQ concerns
- ✓ Cloud connectivity

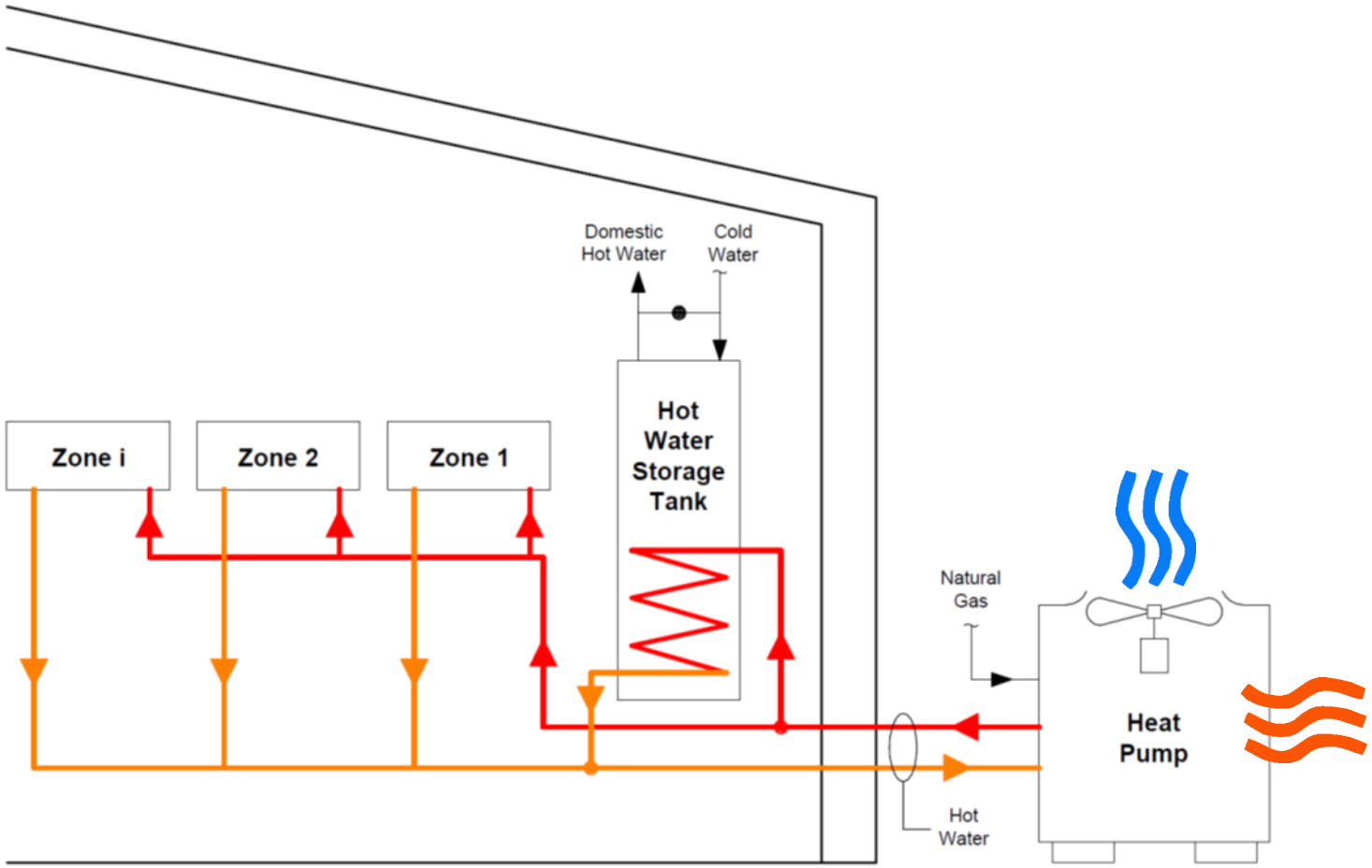


Patent Pending

Hydronic-Combi System

Residential Hydronic Heating

- ✓ Boiler replacement with DHW option
- ✓ Zoned warmth & comfort in very cold weather
- ✓ Low or Medium Temperature Systems *up to 150°F (65°C) supply*
- ✓ Replacement market or new construction
- ✓ Combustion & venting outside



4:1 modulation

Hybrid Furnace Combi-System

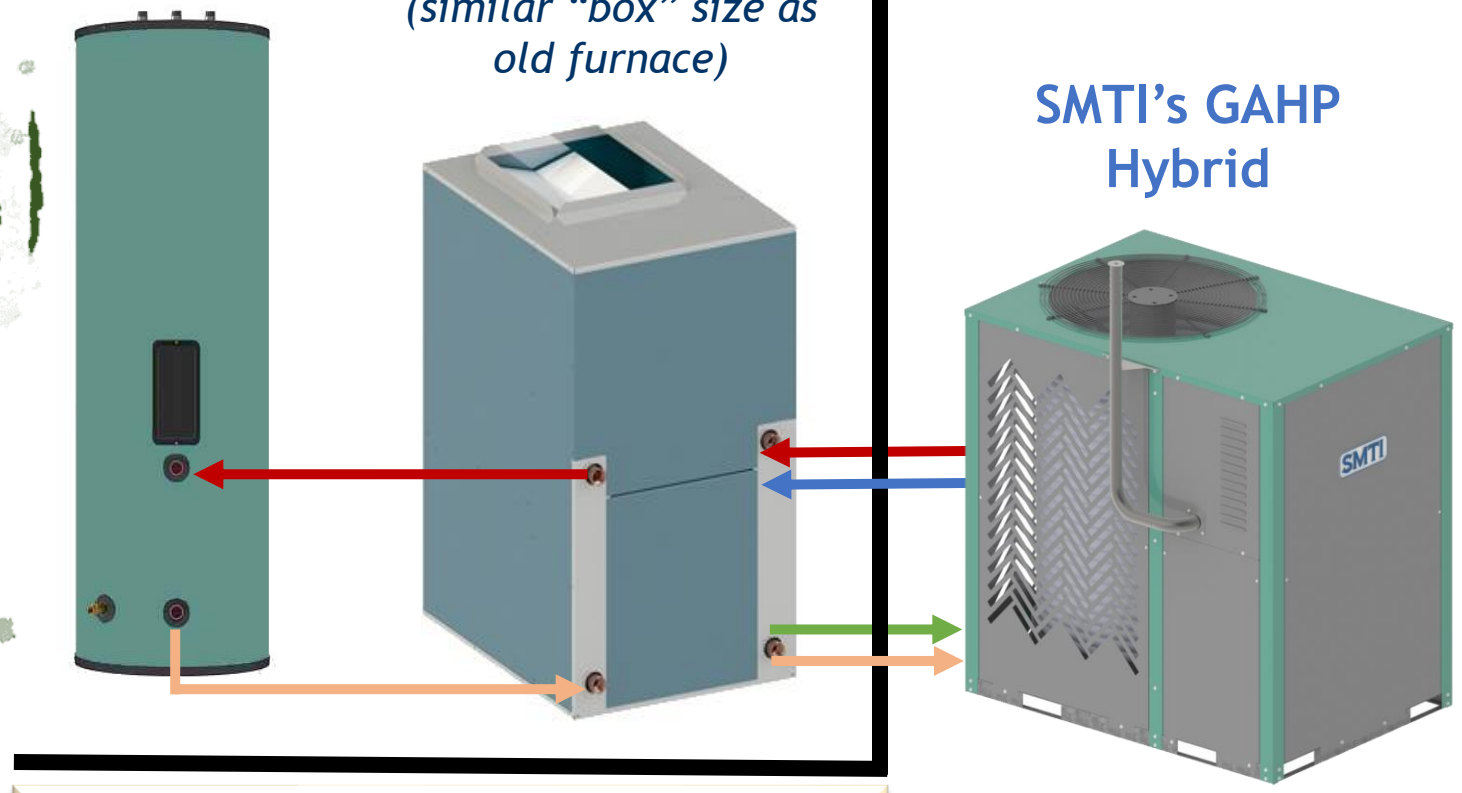
- ✓ All-year comfort heating-cooling & hot water
- ✓ Best of both worlds: 140% AFUE heating, 14-16 SEER cooling
- ✓ "Free" water heating during summer
- ✓ AHU controls modes and distributes hot/cold water where needed
- ✓ Combustion and all refrigerants remain outside

Single Family Residential Heating & Cooling

Indirect Storage Tank

Custom Air-Handling Unit
(similar "box" size as old furnace)

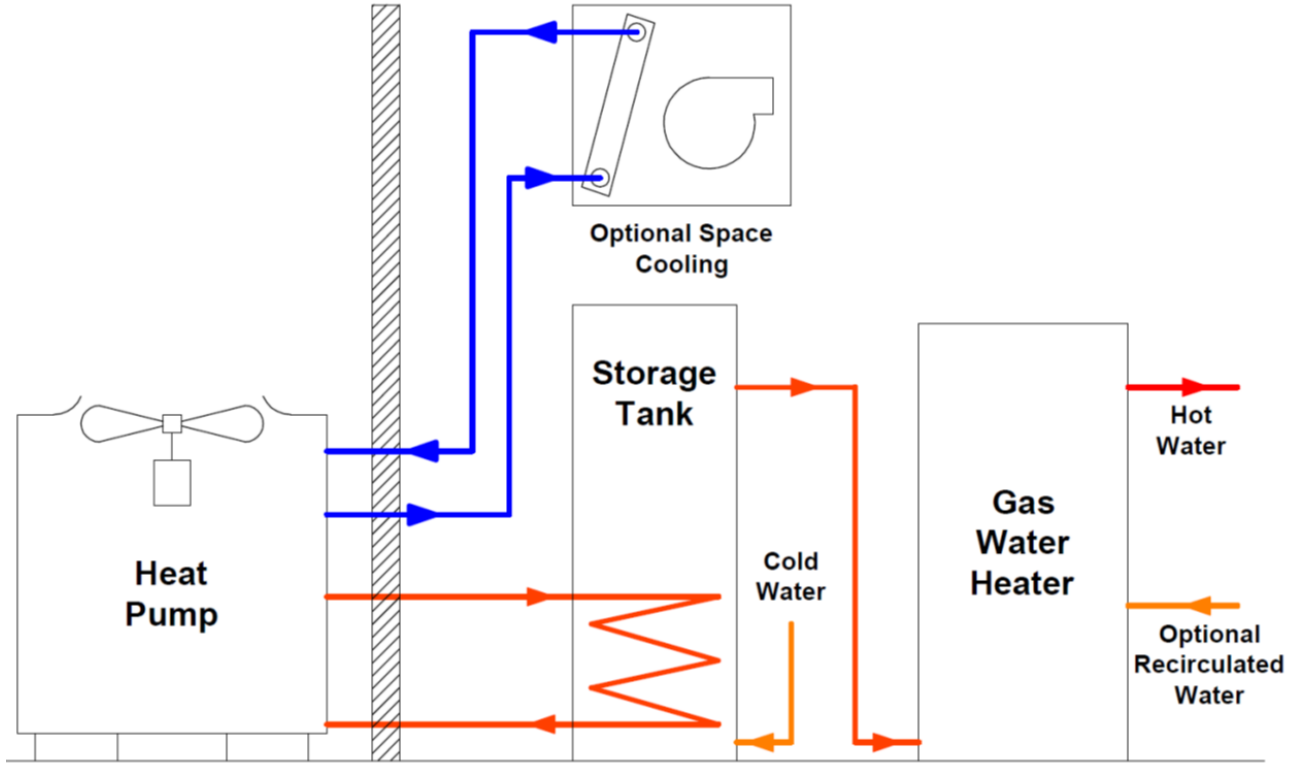
SMTI's GAHP Hybrid



Future Product - Coming Soon

Patent Pending

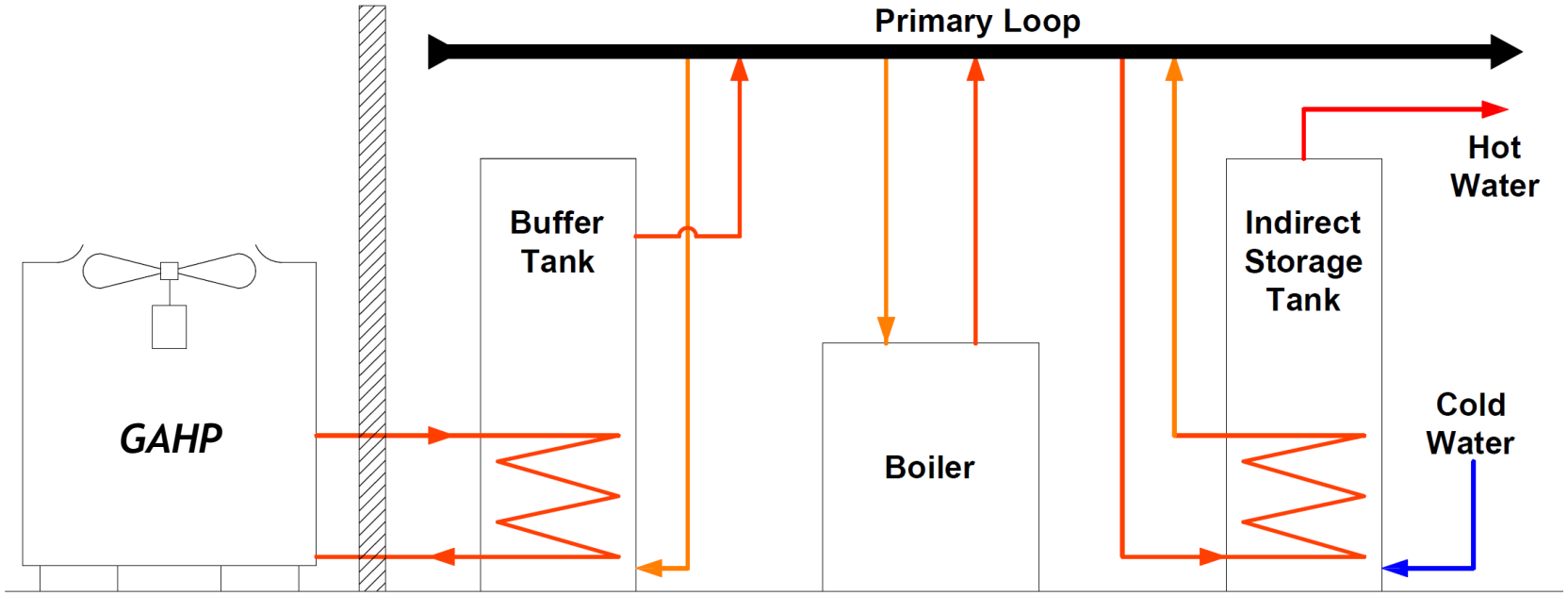
Food-Service & Hospitality Water Heating



Gas Absorption Heat Pump: **Baseload**
Traditional (incumbent) WH: **Peaks / backup**

- Immediately reduces energy, costs, and carbon by 30-50%
- Economics: 1-3 year payback (depends on local climate, energy prices)
- Optional “Free” Cooling during warm weather
- Heats large quantities of water for kitchens, dishwashing, etc.

Multi-Family Space and Water Heating



Gas Absorption Heat Pump: **Baseload**
Traditional (incumbent) Boiler: **Peaks / backup**

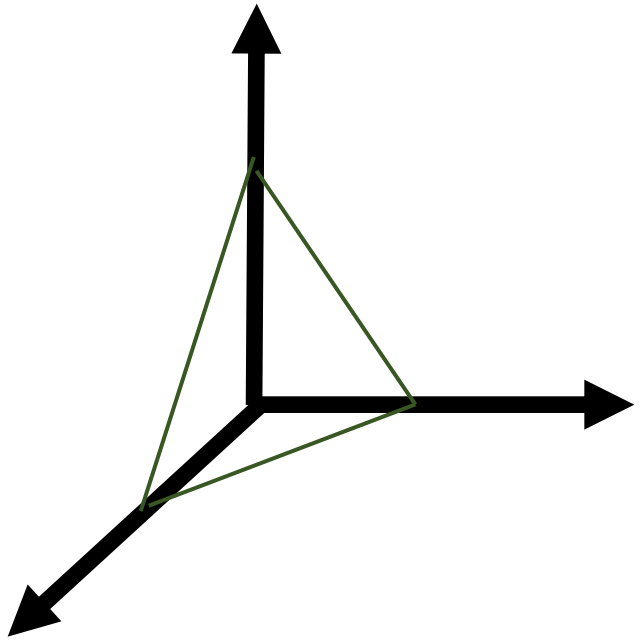
- Immediately reduces energy, costs, and carbon by 30-50%
- Economics: 1-4 year payback (depends on local climate, energy prices)
- Adds life to existing heating equipment
- Avoids costly fuel-switching (to electricity) upgrades to building

Why install a SMTI Gas Absorption Heat Pump ?

Comfort | Economics | Environment

Highest Fuel Efficiency = Lowest Operating Cost

- 140% AFUE*
- Retains High Performance in Very Cold Weather
- **Installation Premium Pays Back in 2-6 years**



Unmatched Environmental Benefits

- 30-50% reduction in CO2 emissions
- Magnifies value of Green Fuels
- Uses natural refrigerants (Zero Global Warming)

End-User Comfort & Safety

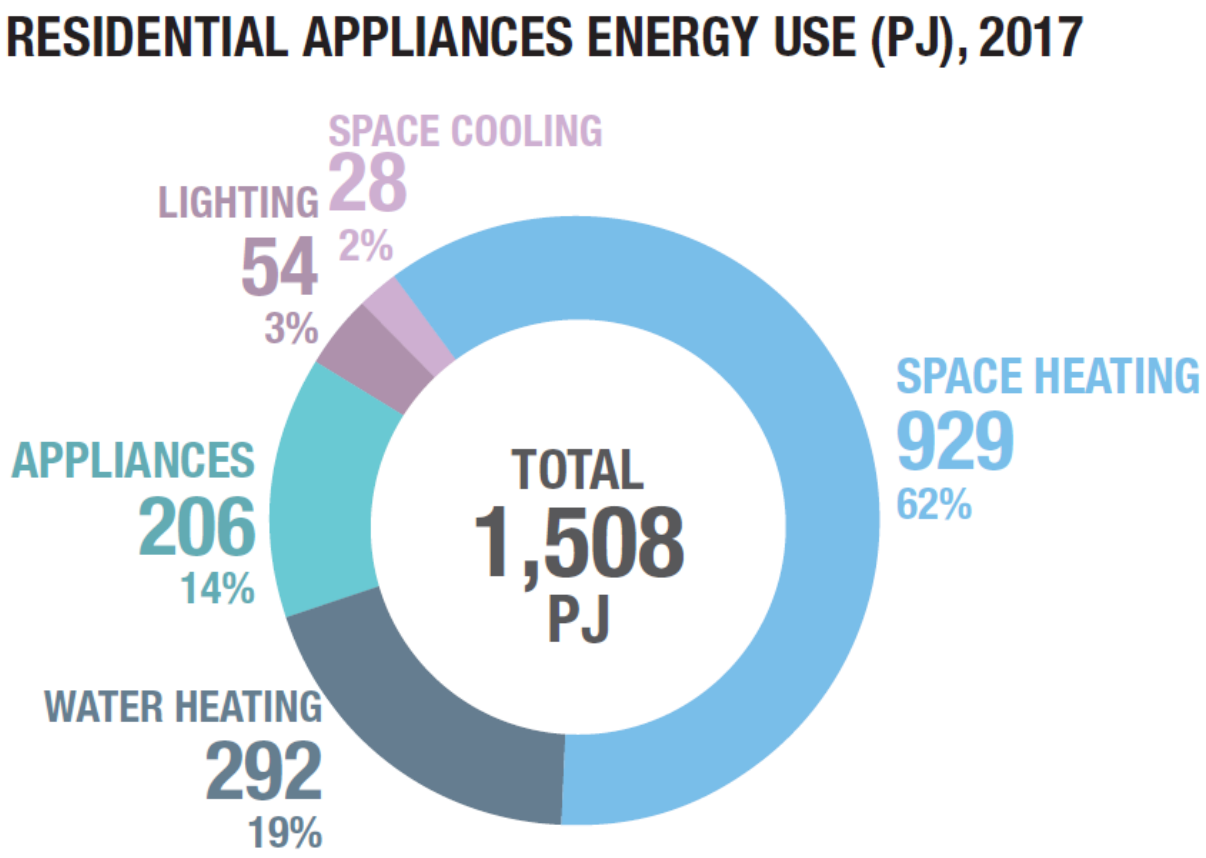
- Strong delivered warmth, even in the coldest weather
- No back-up heating appliance needed
- All combustion, refrigerants remain outdoors

Annual Fuel Efficiency Rating – the efficiency term used for gas space heating appliances (furnaces and boilers are limited to an AFUE < 100%)

Lowest Operating Cost, Lowest Carbon Footprint, Retained Comfort

Why are Gas Absorption Heat Pumps important in a decarbonizing world?

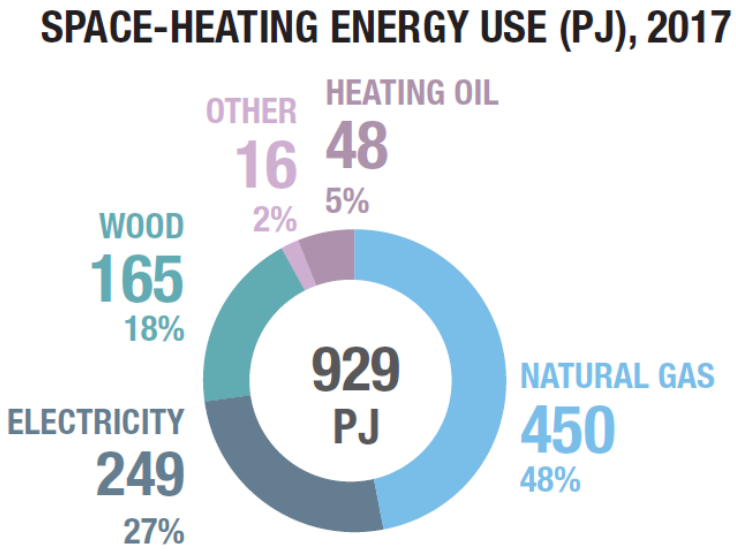
Space/Water Heating 81% of Residential Energy Use in Canada

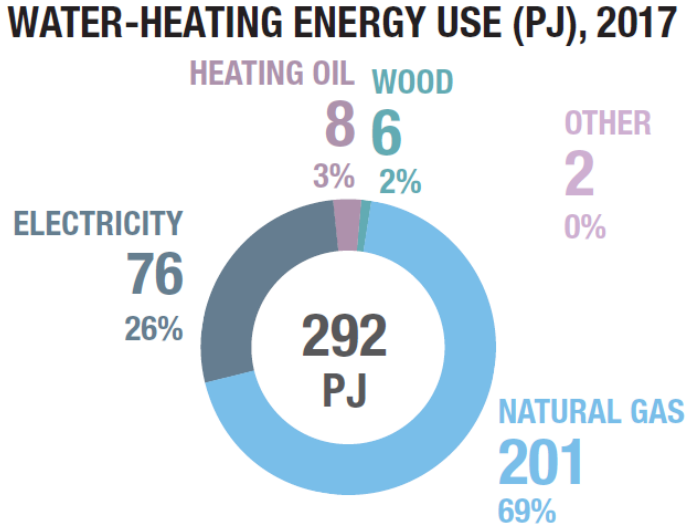


4X

more energy for space/water heating than all other uses combined

Space & Water Heating Are Energy Dense





Source: NRCan Energy Fact Book 2020-2021

Space/Water Heating Predominantly Supplied by Natural Gas

- 651 Petajoules Annually in Canada (180,783 GWh)

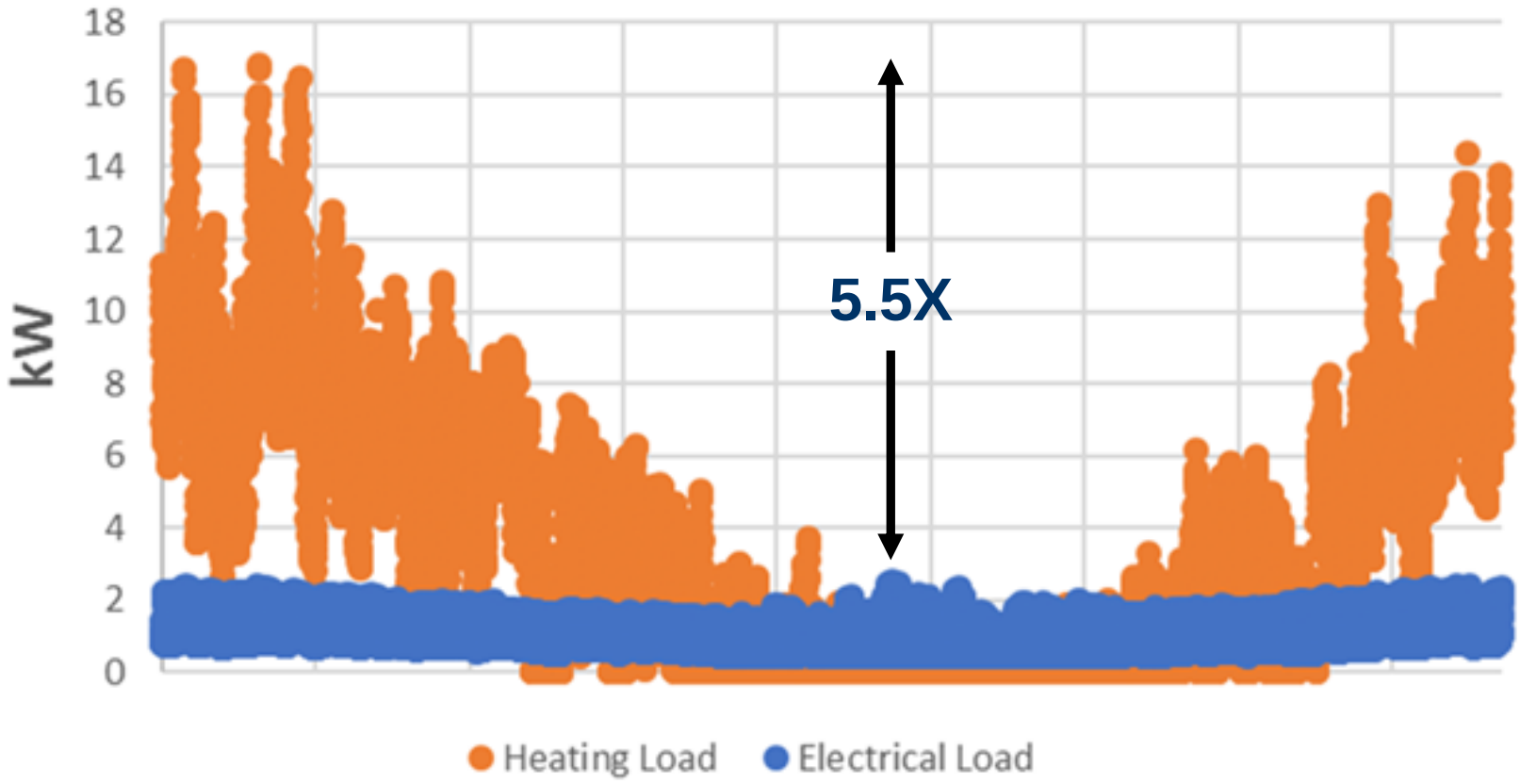
If all Space Heating Converted to EHP at SCOP = 3

- Need additional 60,000 GWh of electricity
- If Wind: 27.5 GW of capacity at 25% capacity factor
- 13,750 2MW Wind Turbines operating 365 days/yr
- **But most space heating concentrated in 3 months.....**

Going to need a lot of LONG TERM Storage

Have not addressed electrification of transportation yet .....

Capacity of the Gas Grid Dwarfs the Electrical Grid



Full Year, Hourly Load Profile: Average Chicago-Area Single Family Home

Source: U.S. DOE, EnergyPlus Modeling

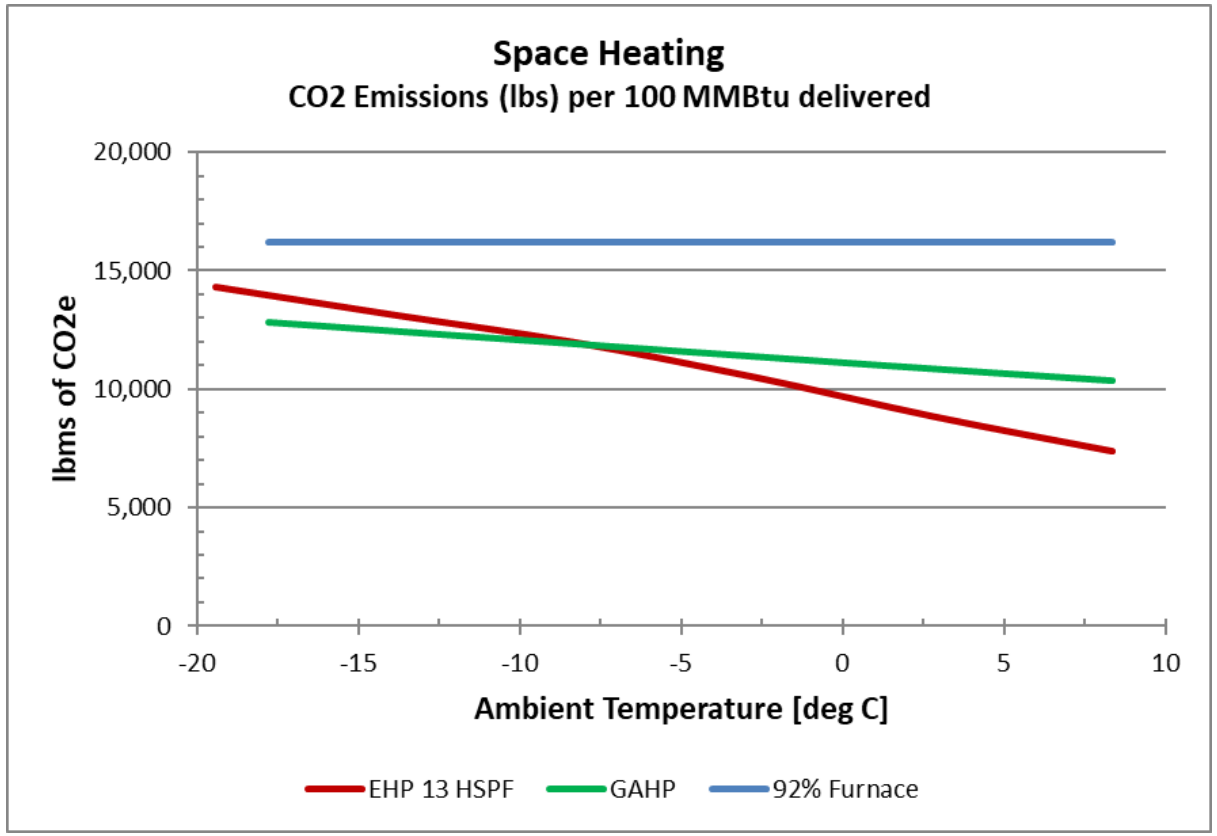
Modeling Cost and Carbon Emission Scenarios

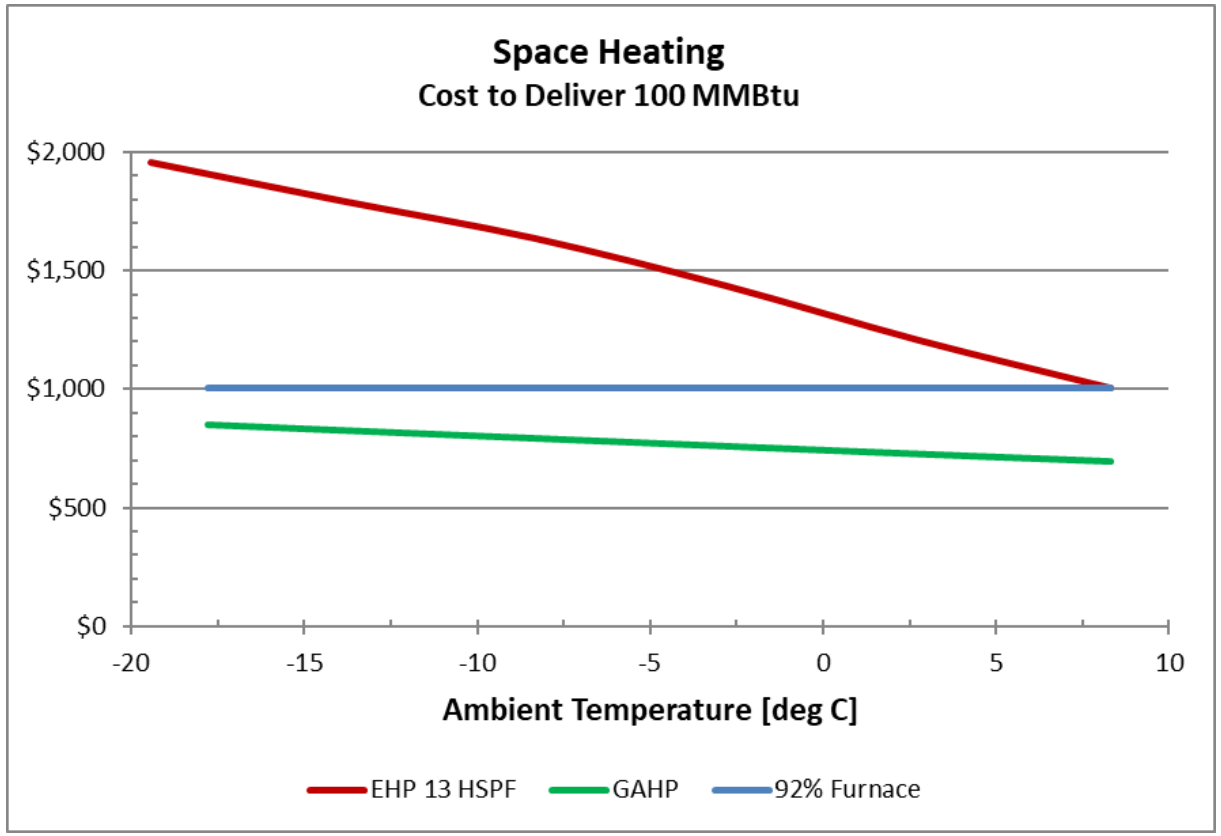
Assumptions

- Very high electrification of heating and transportation sectors
- Heating season electricity at margin is 100% NGCC
- Full-Fuel-Cycle Emission Factors for Building Energy Consumption*
  - Natural Gas Combined Cycle: 467 kgCO2e/MWh
  - Natural Gas Combustion: 231 kgCO2e/MWh

** Full-Fuel-Cycle Energy and Emission Factors for Building Energy Consumption – 2018 Update*
Neil Leslie, Gas Technology Institute. Prepared for American Gas Association.

Cost Effective Decarbonization





Marginal Grid Emission: 467 kgCO2e/MWh (best in class NGCC power plant)

Natural Gas Combustion: 0.231 kgCO2e/kWh

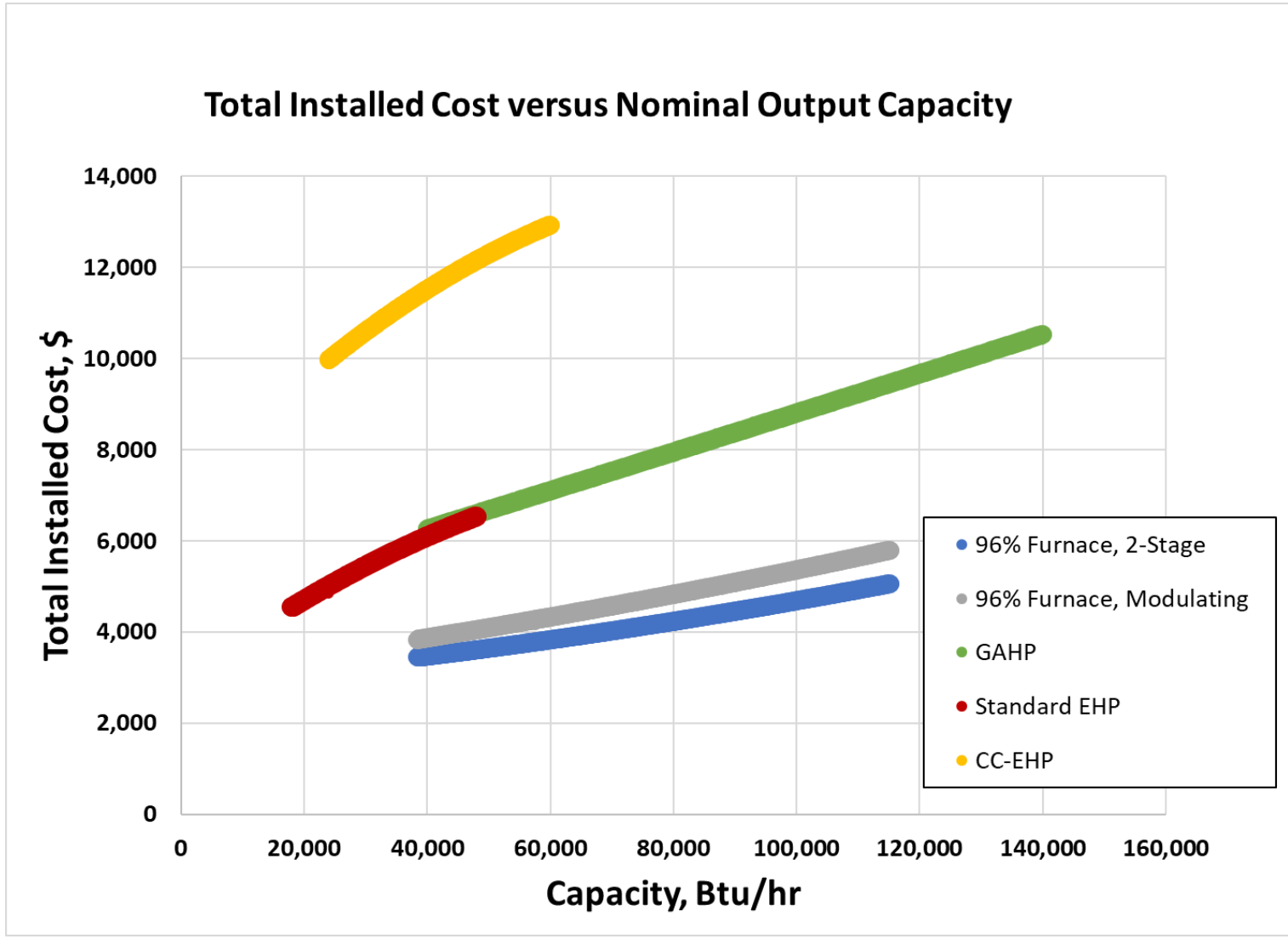
EHP: Carrier 25VNA060A Variable Speed, 20 SEER, 13 HSPF

Natural Gas: $0.32/m3

Electricity: $0.14/kWh

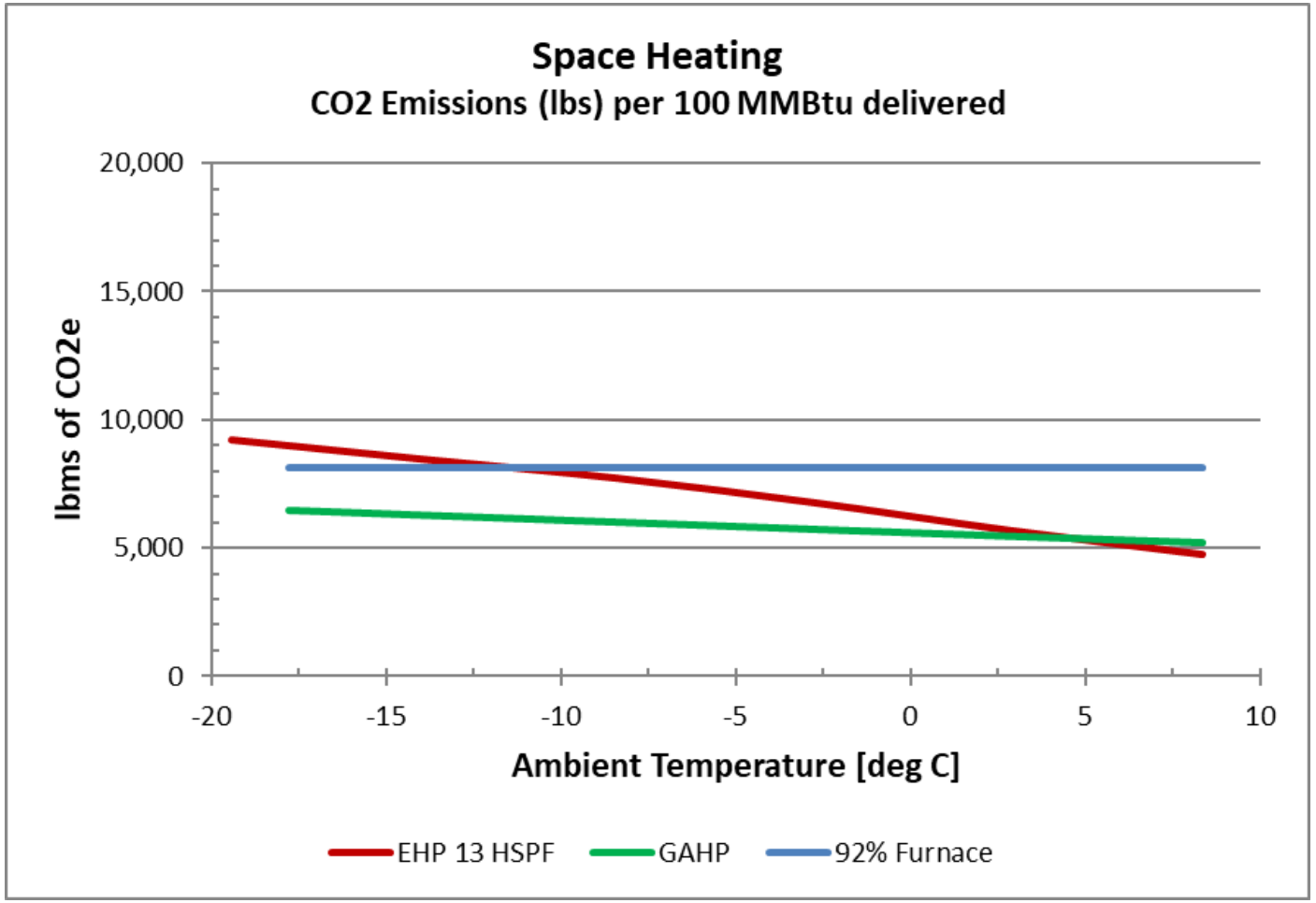
1000 Therms = 100MM Btu = 293,000 kWh

Residential Forced-Air Heating Installed Costs



Informal SMTI Survey, 2019 | U.S. Dollars

Cost Effective Decarbonization



Future Reduction of Full-Fuel-Cycle Marginal Grid Emission: 300 kgCO2e/MWh

Future 50% Carbon Reduction of Natural Gas Grid (Renewable Gas + Hydrogen)

1000 Therms = 100MM Btu = 293,000 kWh

Annual-Hourly Space-Water Heating Modelling

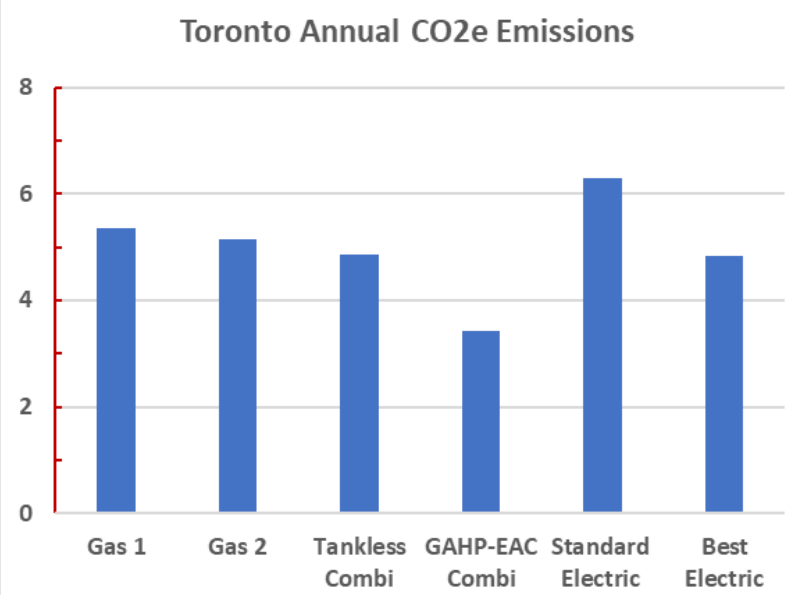
Single Family Homes with < 11.7 kW (40,000 Bth) Design Heating Load

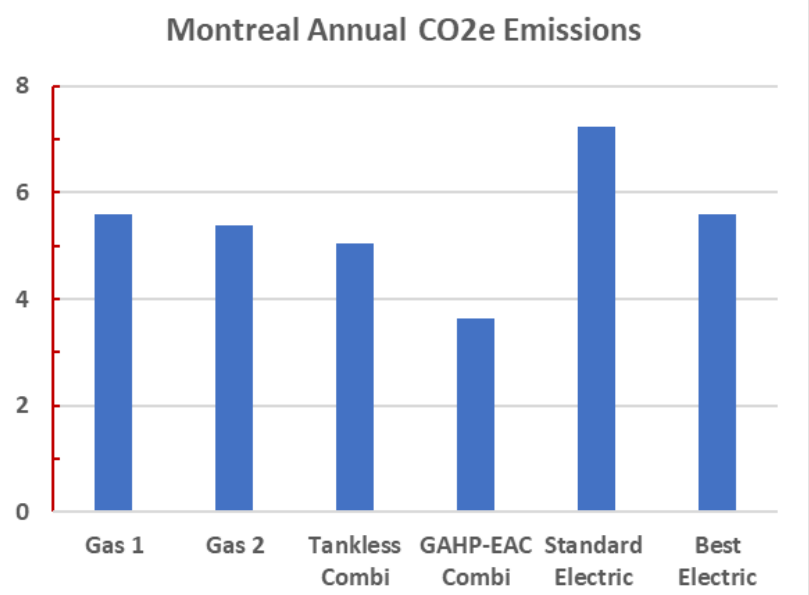
Case	Space Heating	Water Heating
Gas 1	92% AFUE Furnace	0.67 EF gas storage
Gas 2	97% AFUE Furnace	0.67 EF gas storage
Tankless Combi	199 kBtu/hr Condensing	0.96 EF tankless
GAHP Combi	SMTI GAHP	SMTI GAHP + 65 gal IST
Standard Electric	7.7 HSPF EHP	0.92 EF electric storage
Best Electric	10 HSPF EHP	0.92 EF electric storage
EnergyPlus + Standard BEopt 2.8 options		

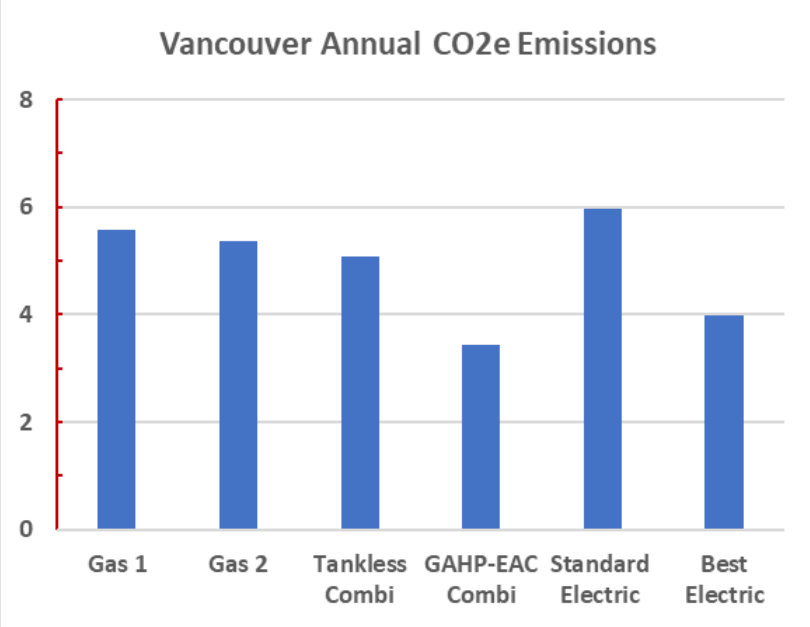
		Toronto	Montreal	Vancouver	Calgary
Electric Price	**$/kWh**	$0.14	$0.07	$0.12	$0.16
Natural Gas Price	**$/m^3**	$0.41	$0.69	$0.36	$0.35

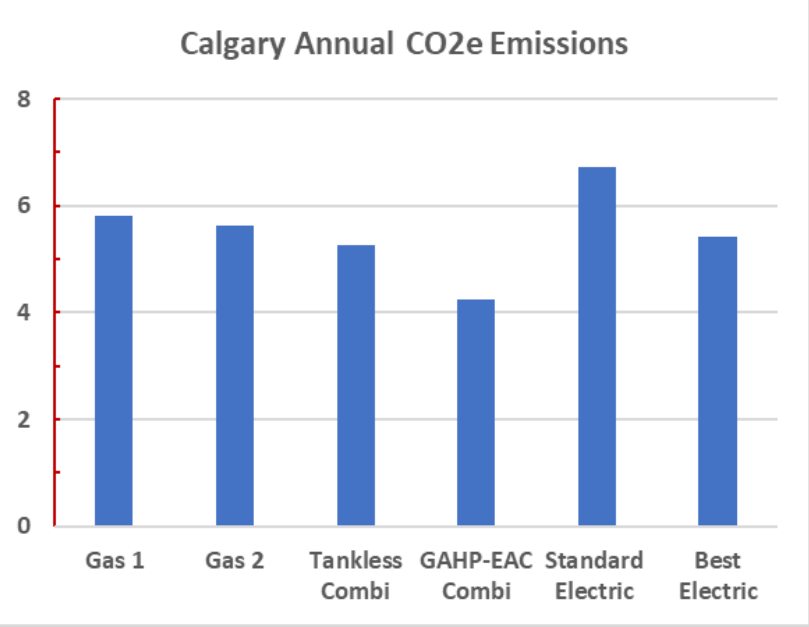
Analysis by Gas Technology Institute (GTI) and SMTI

Annual CO2e Emissions - Metric Tons



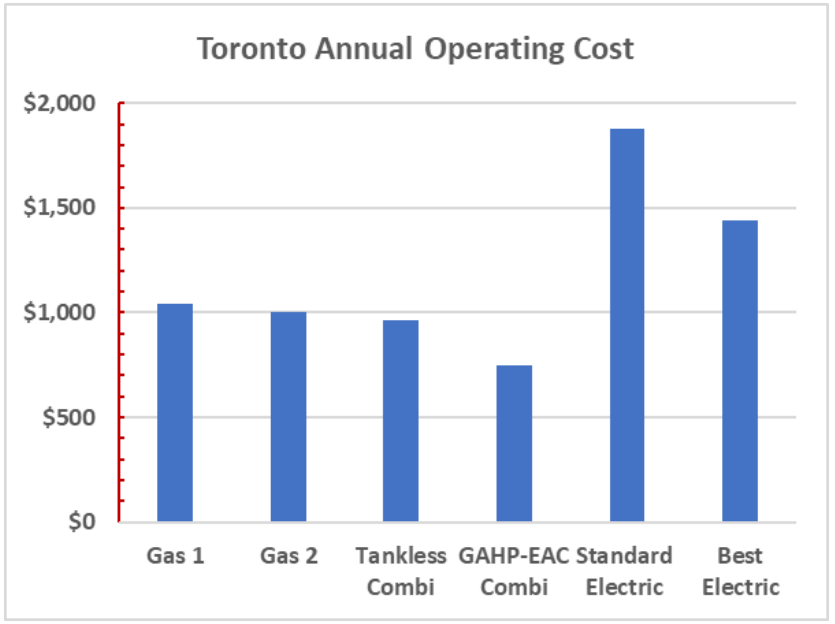


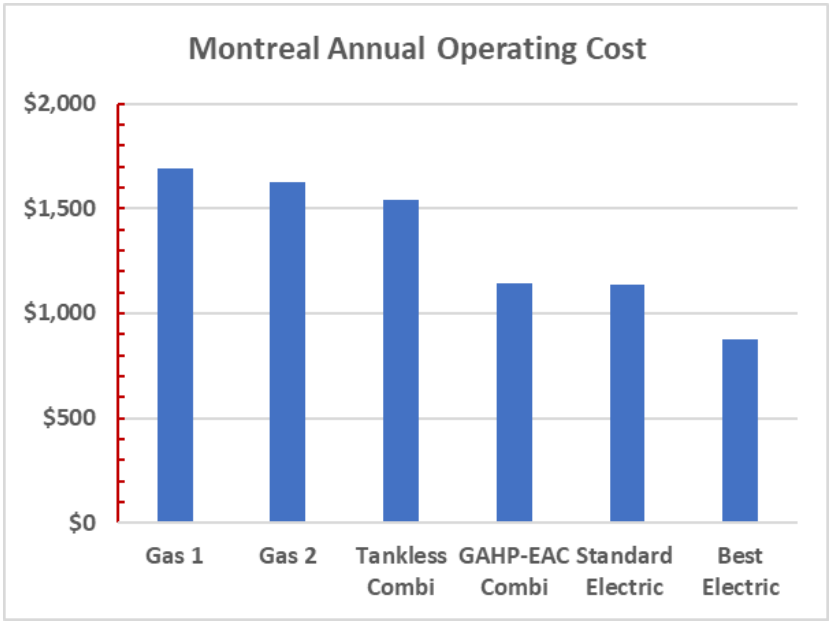


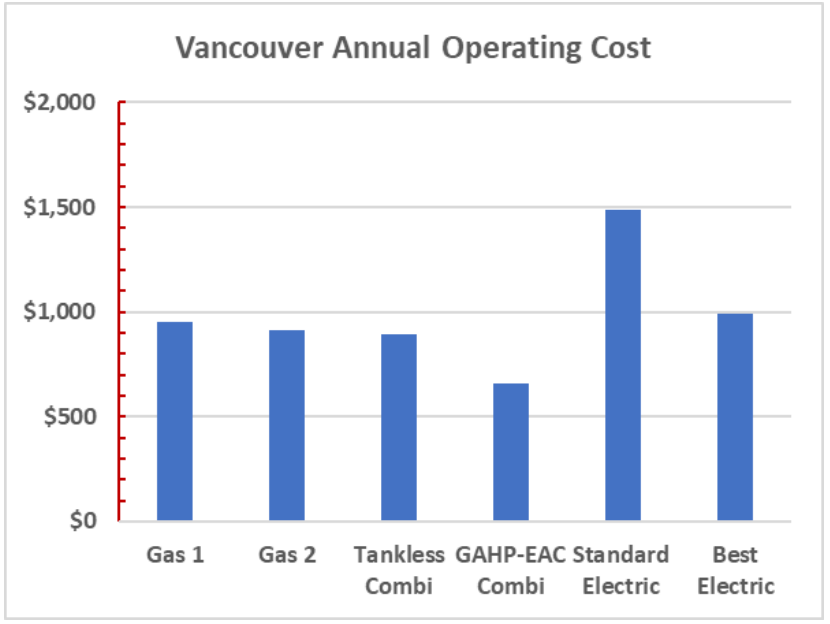


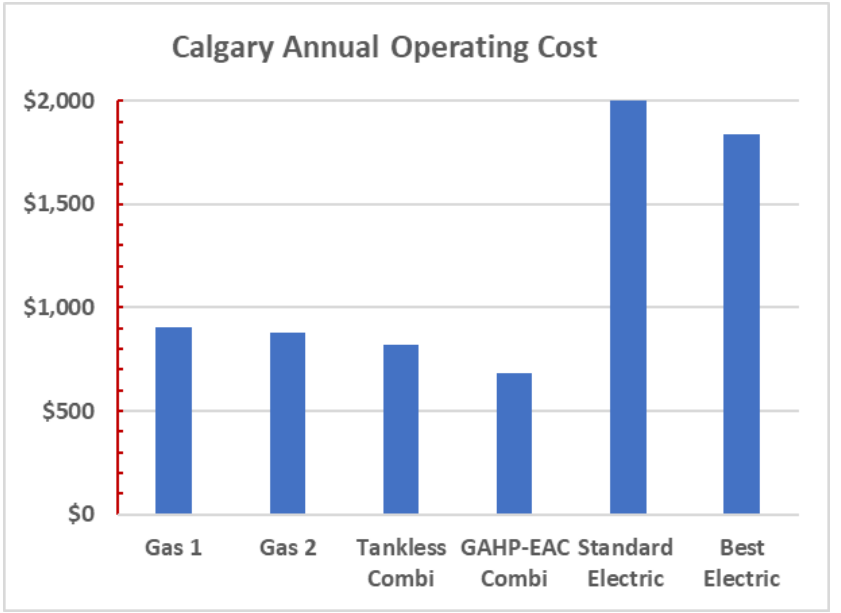
Analysis by Gas Technology Institute (GTI) and SMTI

Annual Operating Cost









Analysis by Gas Technology Institute (GTI) and SMTI

Canadian-focused Product Development

EMISSIONS REDUCTION ALBERTA

The 2020 Natural Gas Challenge Grant

- ❑ Install 5 Residential Combi GAHPs in Alberta
- ❑ Performance & Comfort Assessment
- ❑ Canadian-focused market research

Gas Absorption Heat Pumps

- Immediate Carbon Reduction for Space/Water Heating
  - While Reducing Utility Costs for End User
  - Without Need to Massively Expand Electric Grid
- Provide a Pathway to Net-Zero with Renewable Gas & Hydrogen
- Maintain End-User Comfort
- Great Cold Weather Performance
- Have a Proven Track Record
- Residential & Commercial Applications
- Replacement & New Construction

Commercial Release

Fall 2022

Stone Mountain Technologies, Inc.

Comfort for Less

Gas Absorption Heat Pumps

Very High-efficiency / Low-Carbon Building Heat

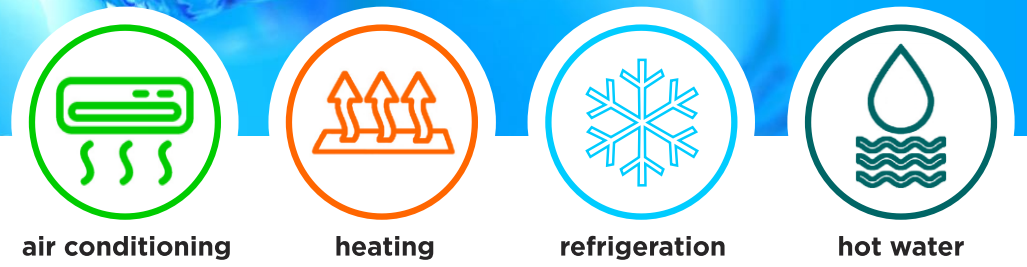
Michael Garrabrant, President/CEO
(423) 735-7400
mgarrabrant@stonemtntechnologies.com

Scott Reed, VP Strategy & Marketing
(818) 421-4229
Scott.Reed@StoneMountainTechnologies.com

www.StoneMountainTechnologies.com
www.linkedin.com/company/stone-mountain-technologies-inc./

Clean Energy Game-Changer

Carbon-Free
Emission-Free
No Toxic Refrigerant



THERMOLIFT
The Future of Clean Energy

thermoliftenergy.com

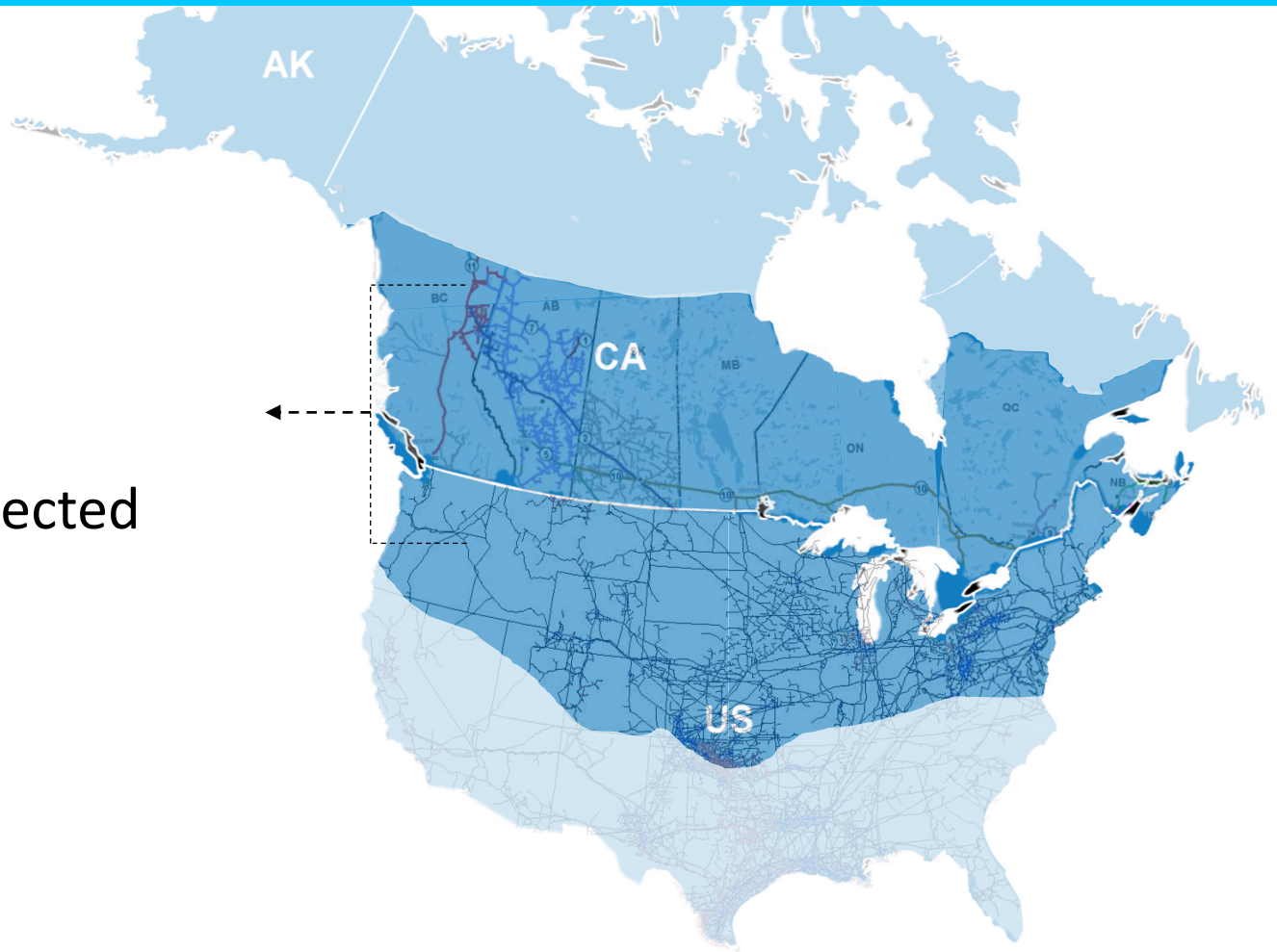
GHP Technology Readiness for NA Market
Enbridge 6/23/2021

Gas Connected Heating Market

Cold-Climates North America

32M HOMES

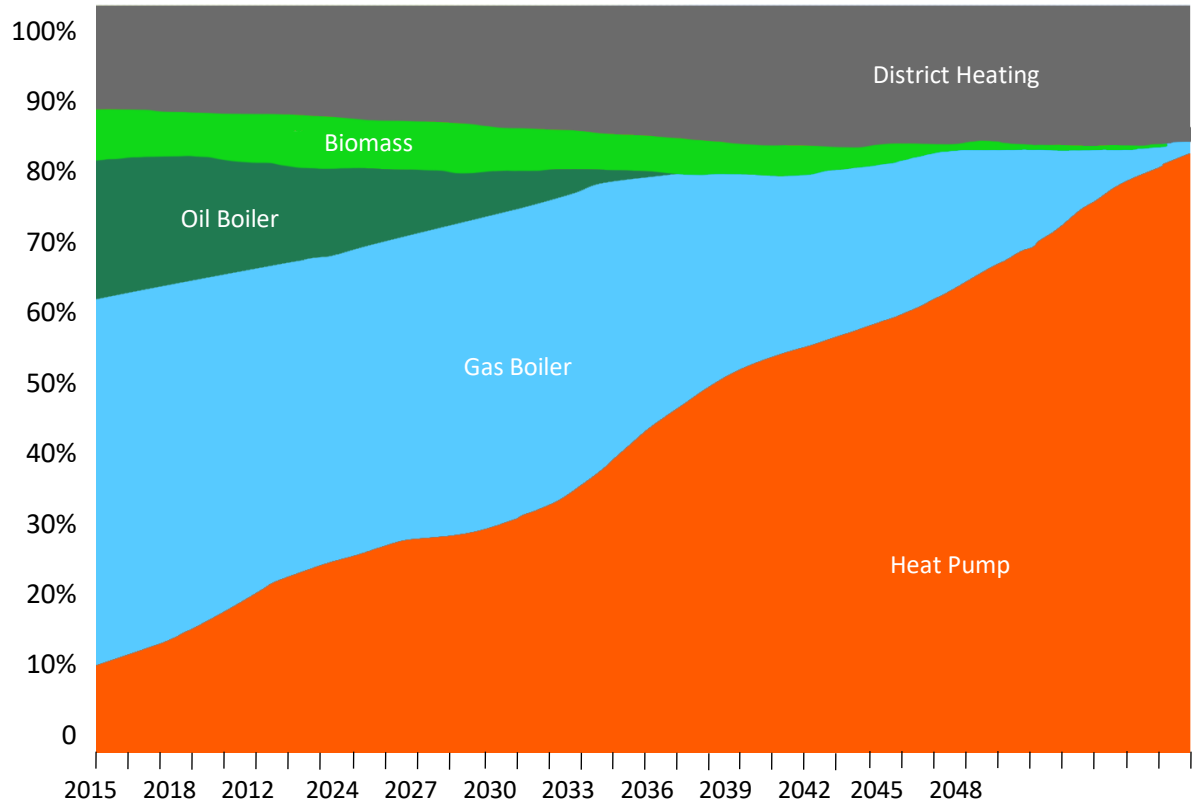
- Cold Climate
- Natural gas connected



THERMOLIFT
The Future of Clean Energy

GHP Will Disrupt Existing Heating Markets

Total number of installed systems



80% Market Share

(up from 10%)

THERMOLIFT
The Future of Clean Energy

Fraunhofer Institute: EHPA meeting 2018, Brussels

See the ThermoLift Advantage

The Hofbauer Cycle—first major new technology for this market

The Hofbauer Cycle

Heating, Cooling +
Refrigeration Capability

"TC3" Thermal Compression Heat Pump

Hydrogen Ready
Ultimate fuel flexibility

Clean
Lowest emissions

Toxic Refrigerant-Free
Zero global warming potential

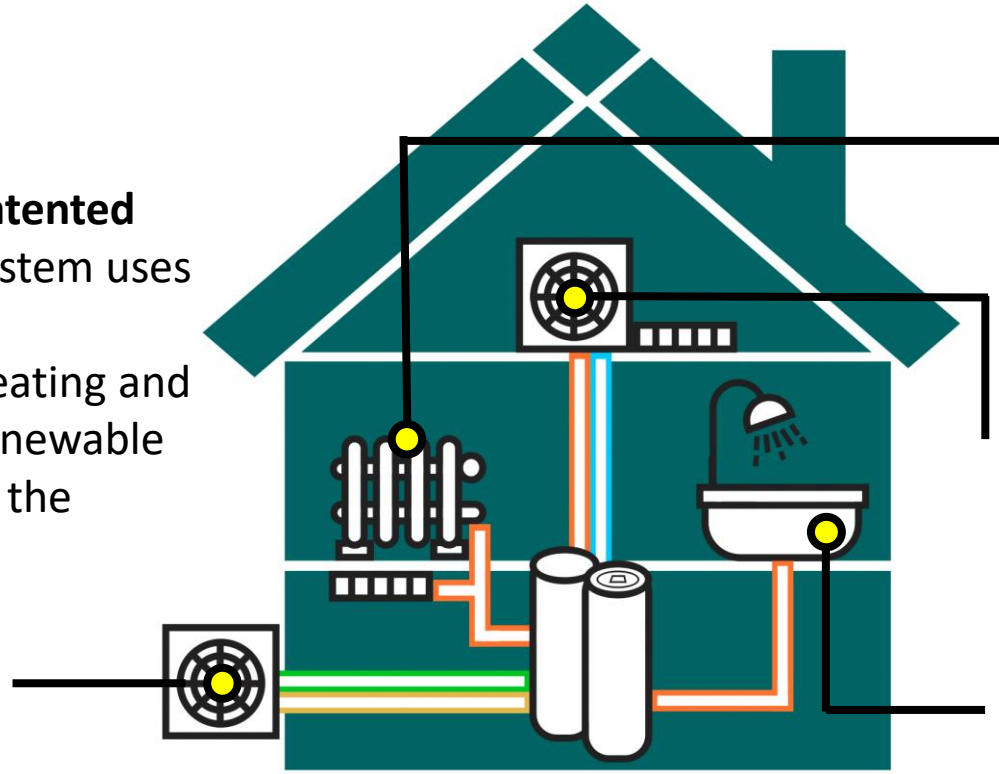
THERMOLIFT
The Future of Clean Energy

Ease of Installation + Building Integration

Innovative technology transitions to competitive market leader with economic incentives to achieve large scale adoption. ThermoLift will seamlessly fit into most existing commercial, residential, industrial and retail building footprints.

TC3

ThermoLift's unique, patented Hofbauer Cycle (TC3) system uses natural gas or hydrogen as its primary fuel for heating and cooling and captures Renewable Heat Energy (RHE) from the outside ambient air.



1 The heat from the burner **plus** RHE from outside is sent to any radiator, air-handler, or underfloor heating system.

2 As an air conditioner, the system pulls heat out of the house and delivers it to hot water.

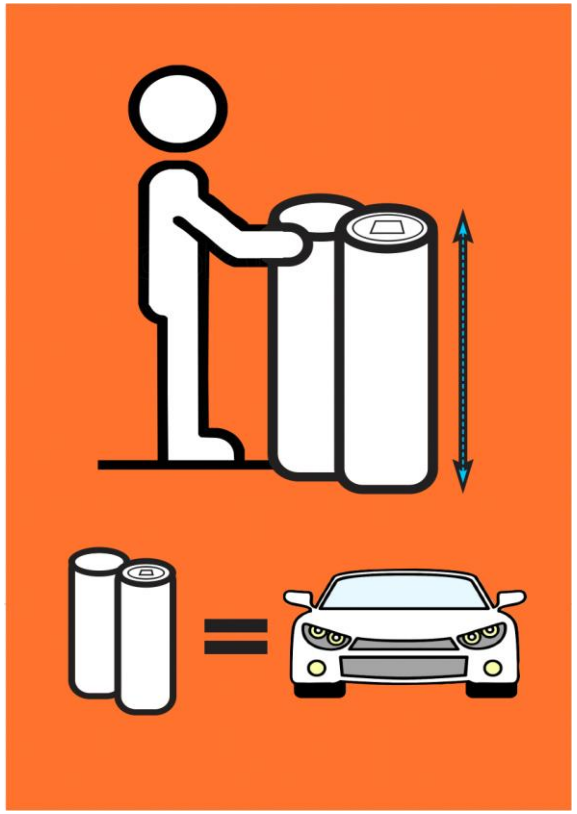
3 The same heat can be used for hot water delivery.

THERMOLIFT
The Future of Clean Energy

A "Game-Changer"

Affordable and efficient technology leading the way to help customers achieve net-zero GHG goals (Green House Gas).

- Up to **50% Reduction** in building HVAC energy cost, CO2 / GHG emissions.
- **Hydrogen-Ready**—Capability allows system to integrate seamlessly with hydrogen economy, ZERO CARBON
- **No Global Warming Refrigerants**—No toxic leakages, lower operating cost.
- **Emission-free**—Virtually zero-emissions (i.e. better than EU and California indoor air quality regulations and standards).
- **One Device**—Heating, air conditioning and hot water, simultaneous hot & cold outputs, modulating real-time demand response.
- **Renewable Energy for Heating**—Capturing free heat from ambient.
- **Cold-Climate Heating**—No additional heat source needed even < 0°F.
- **Cooling without electricity**—Off grid capability, avoids inefficient electric grid energy production.



THERMOLIFT
The Future of Clean Energy

The Future is Now

Global Warming Refrigerant-Free, Emission-Free HVAC

ThermoLift Provides Up to

50% Reduction in HVAC costs and associated reductions in greenhouse gas emissions.

The Problem

- The USA spends over $200 billion on HVAC annually
- USA Grid inefficiency costs $70-$120 billion annually
- In the USA, 17% of total energy is consumed for HVAC
- The USA, emits nearly one billion tons of CO_2 for HVAC

The Solution

- 30-50% Energy Reduction in HVAC
- Superior Cold Climate / Partial-Load Performance
- One Appliance – Heating, Cooling and Hot Water
- Performance Exceeds DOE Heat Pump Targets
- No Compressors – No Toxic Refrigerants
- Almost No Electricity / Grid Independent
- Commercial, Industrial and Residential Markets

Progress + Success

- Broad Operating Range
- Tested at Oak Ridge National Laboratory to -150°F
- Ranked No.1 by US DOE

THERMOLIFT
The Future of Clean Energy

www.thermoliftenergy.com

ThermoLift is Heating Up

Integration + Flexibility + Market Partners

- ThermoLift is an integral component in the transition to low carbon, highly efficient, hot water systems
- ThermoLift is Hydrogen + RNG capable out of the box
- ThermoLift maximizes both carbon reduction + affordable operation
- ThermoLift has no toxic refrigerants + zero global warming potential + very low embedded carbon
- ThermoLift has very low operating costs + minimal maintenance

ThermoLift works with:

- OEM Partners for system integration
- Installation partners to become Trade Allies
- Finance Partners
- Engineering firms to become certified specifiers

Feel the Thermolift Advantage

Decarbonization without Electrification, Cost Effective + Practical Alternative

#1 DOE Rank

- **Ranked #1** amongst 300 emerging technologies
- **Ranked #1** for energy savings potential

Applications

3-in-1 Heating, Cooling + Hot Water
- Water Heating
- Space Heating
- Space Cooling

Multiple Sources
- Air
- Water
- Process
- Geothermal

Capabilities

- **Cold Climate Capabilities—** unsurpassed by any technology
- **150˚F Hot Water**

Implementation

Significant Supporters
- Utility Companies
- Engineers
- Installers

Demonstration Programs
- Fortis
- NGIF
- Con Edison
- Additional US + Canadian Programs

THERMOLIFT
The Future of Clean Energy

www.thermoliftenergy.com

Broad Application Range

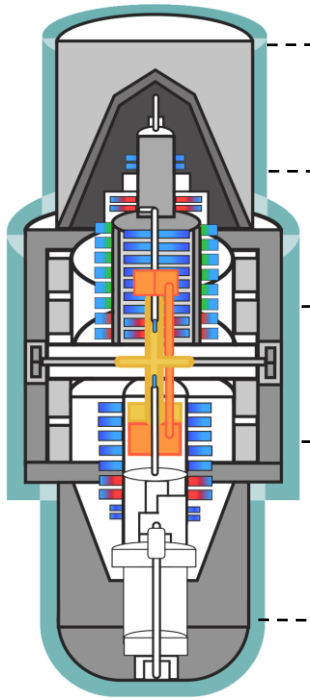
Total Building HVAC + Expanded Markets

INPUT

Renewable Energy
(>50%) Geothermal,
Air Source / Aerothermal,
Water Source

Drive Energy
Hydrogen, Natural Gas,
Electricity, Solar-Thermal,
Biogas, Biodiesel

OUTPUT



- HOT
- WARM
- COOL
- COLD
- CRYO

MARKETS

Building Heating & Cooling Markets
- Residential
- Commercial
- Hospitality
- Restaurant
- Hospital
- Nursing Home
- University
- Pad-Site Retail
- Convenience Store

Refrigeration Markets
- Supermarkets
- Cold Storage Warehouse
- Walk-In Coolers
- Flash Freeze Processing

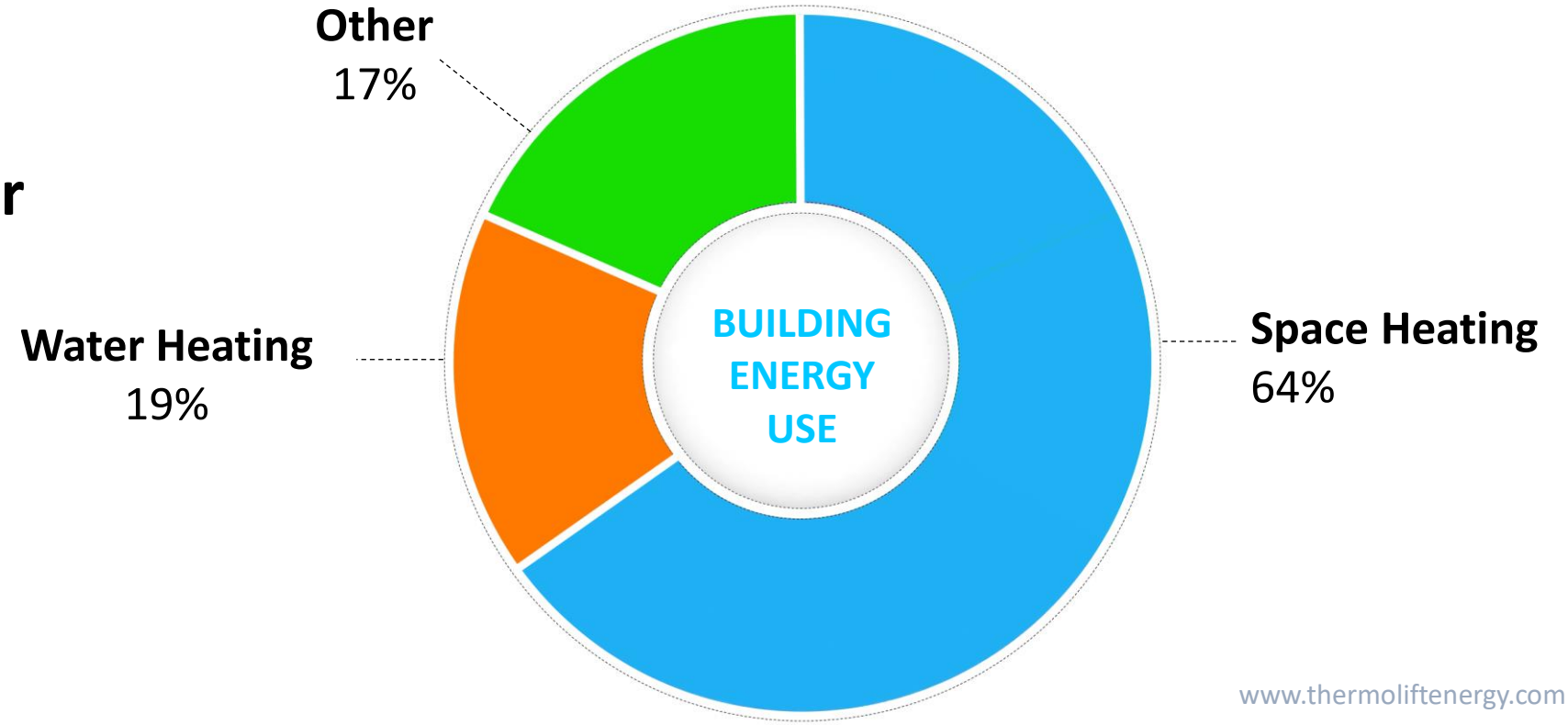
Industrial Markets
- LNG Liquefaction
- Boil-Off Gas Management
- Fractionalization NG Liquids
- H2 Cryo-compression

COP (Coefficient of Performance) = (Renewable + Drive Energy)/(Drive Energy)

Ontario Residential Energy Use

Cold climate building heating requires an affordable and Efficient climate friendly solution other than electrification.

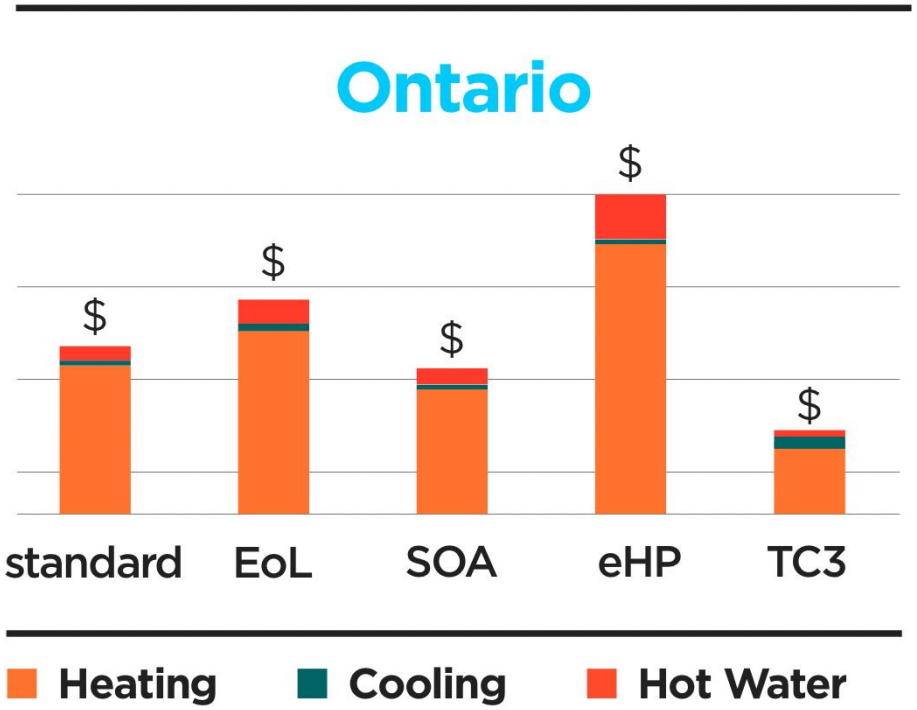
Heating and Water Heating accounts for 83% of Energy Consumption



THERMOLIFT
The Future of Clean Energy

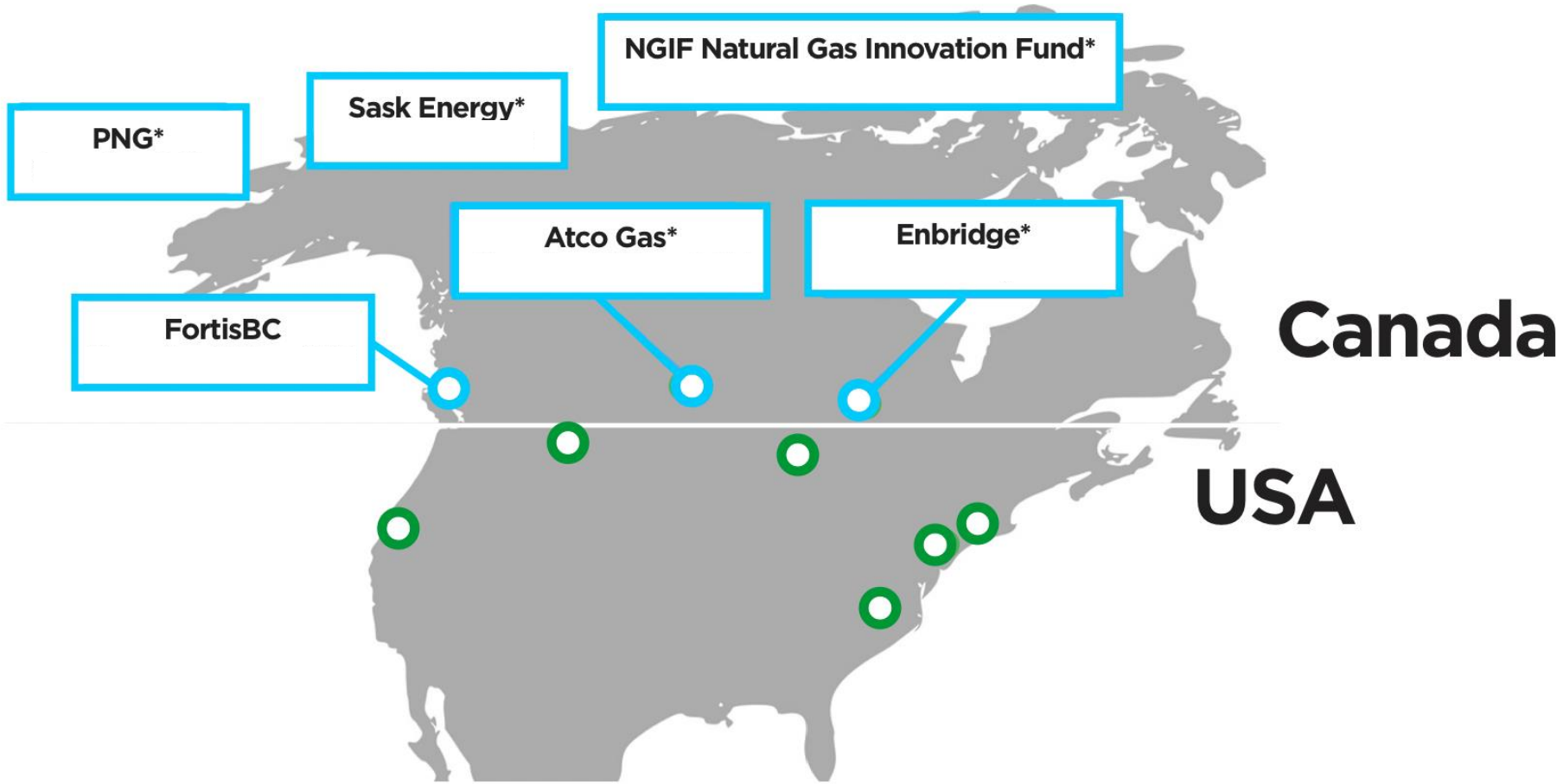
ThermoLift Implementation in Ontario

Annual operating costs in Ontario across 5 equipment scenarios



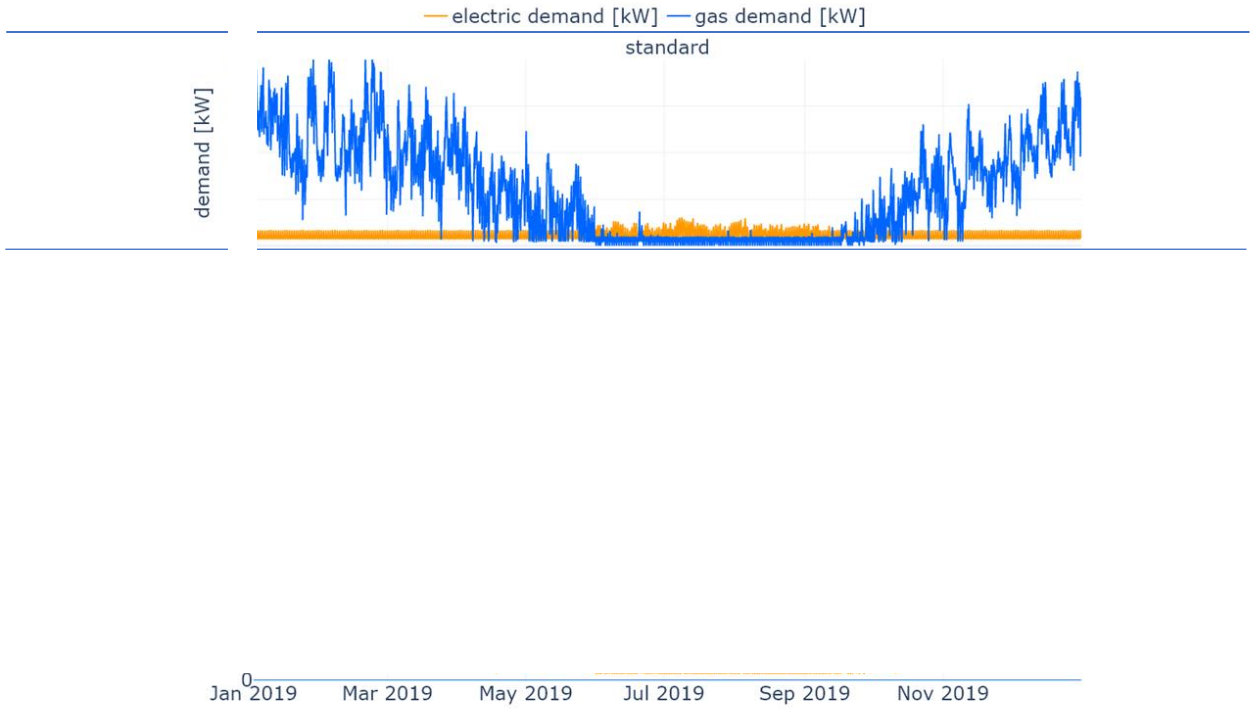
THERMOLIFT
The Future of Clean Energy

Demonstration Across Canada



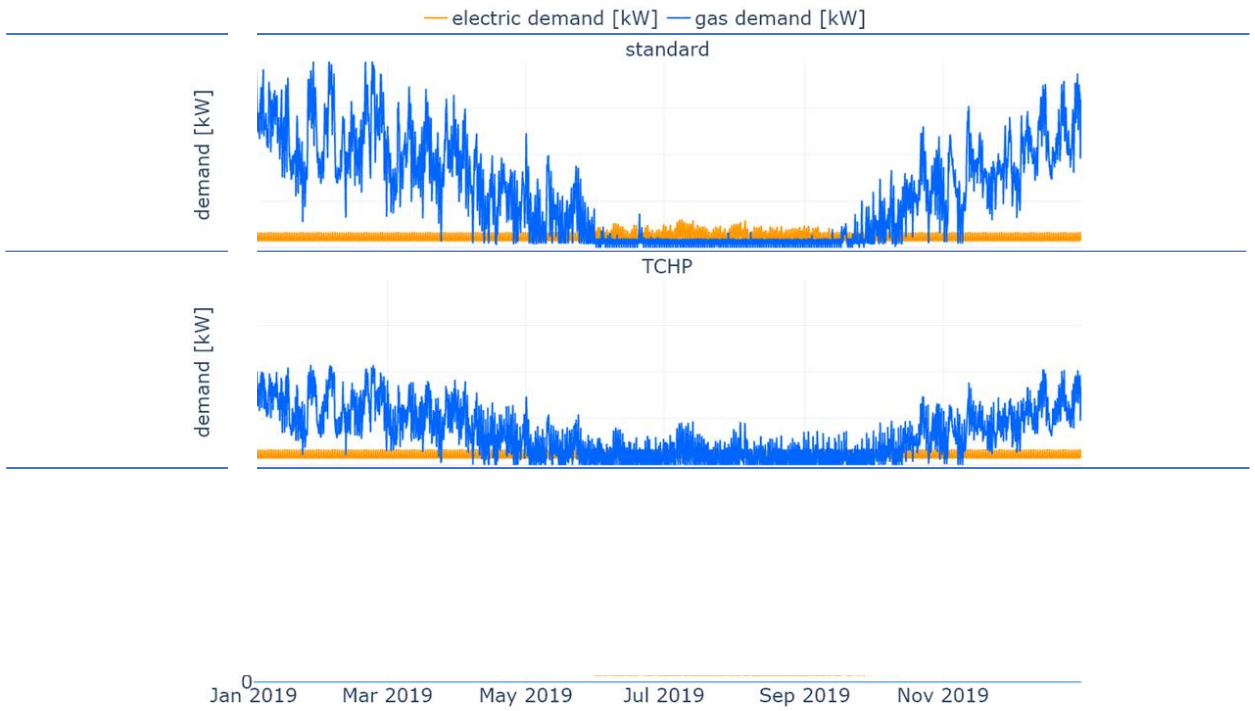
THERMOLIFT
The Future of Clean Energy

ThermoLift – low cost efficiency and resiliency



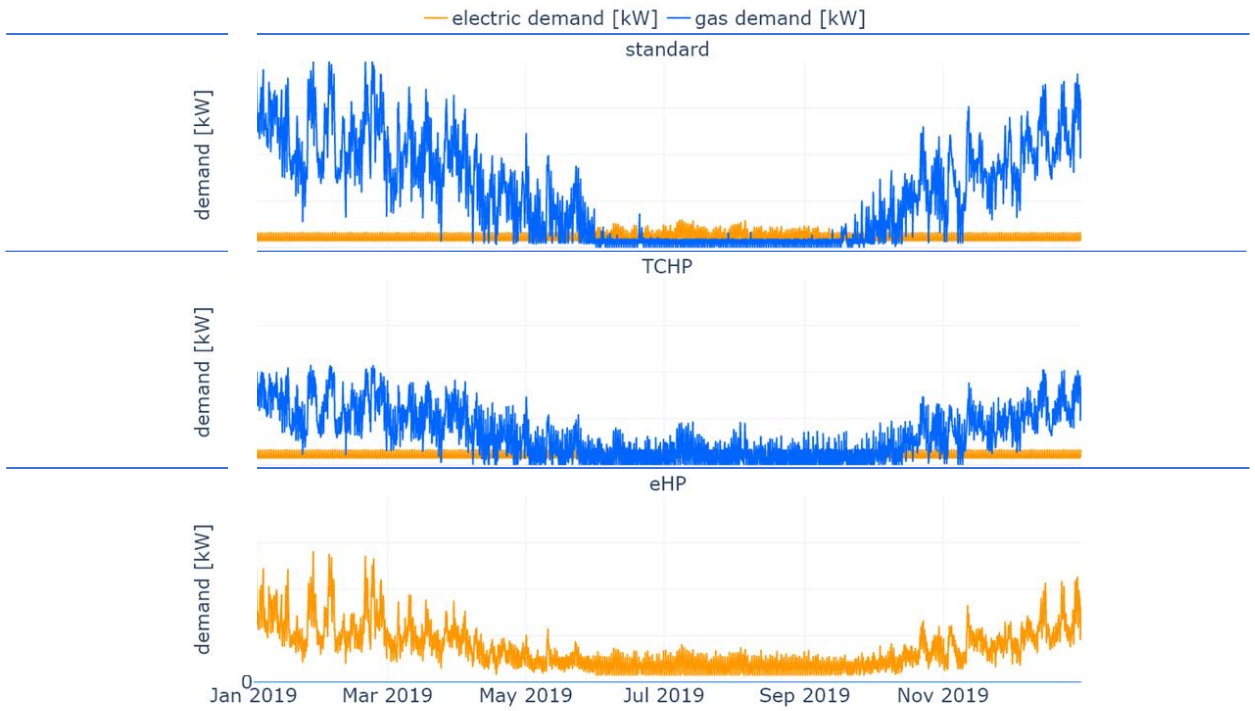
THERMOLIFT
The Future of Clean Energy

ThermoLift – low cost efficiency and resiliency



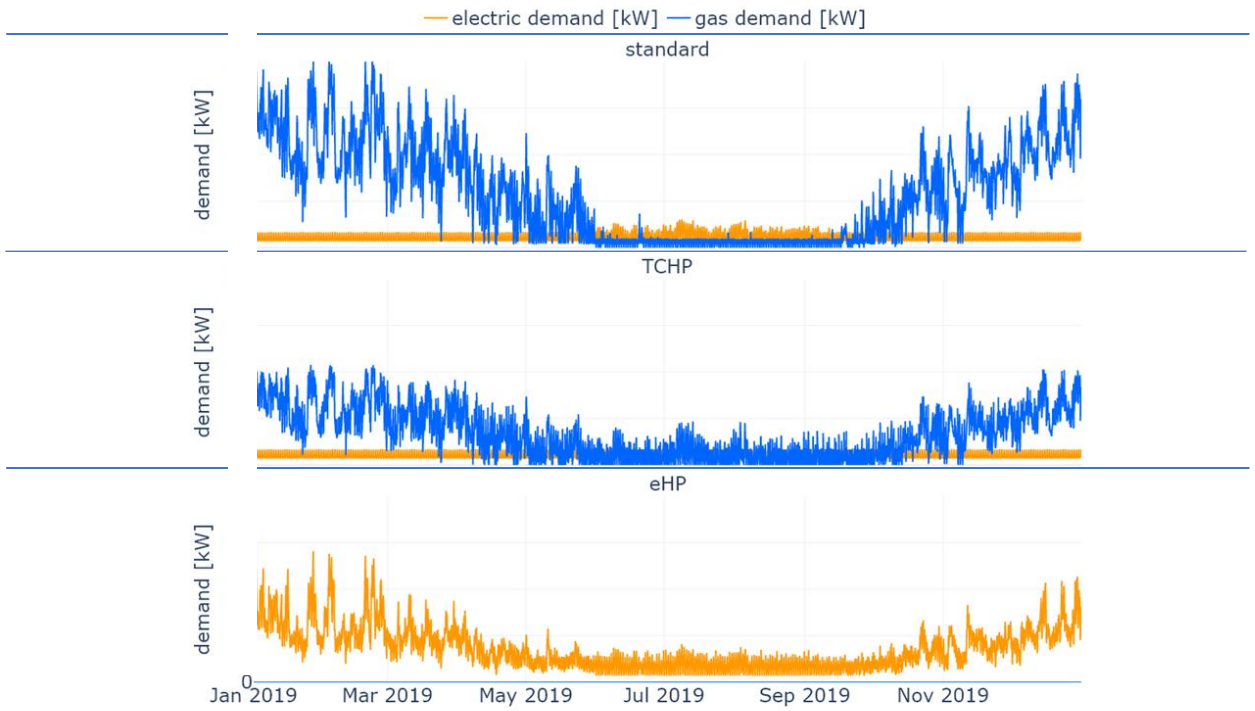
THERMOLIFT
The Future of Clean Energy

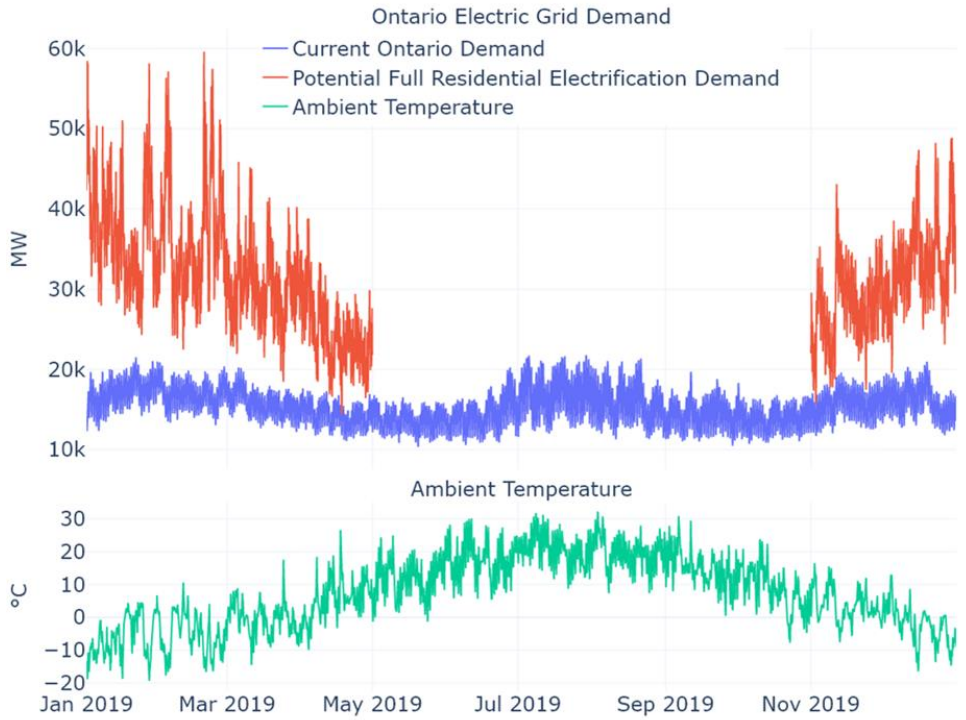
ThermoLift – low cost efficiency and resiliency



THERMOLIFT
The Future of Clean Energy

Electric Heat Pump – 3X Peak Electric Demand

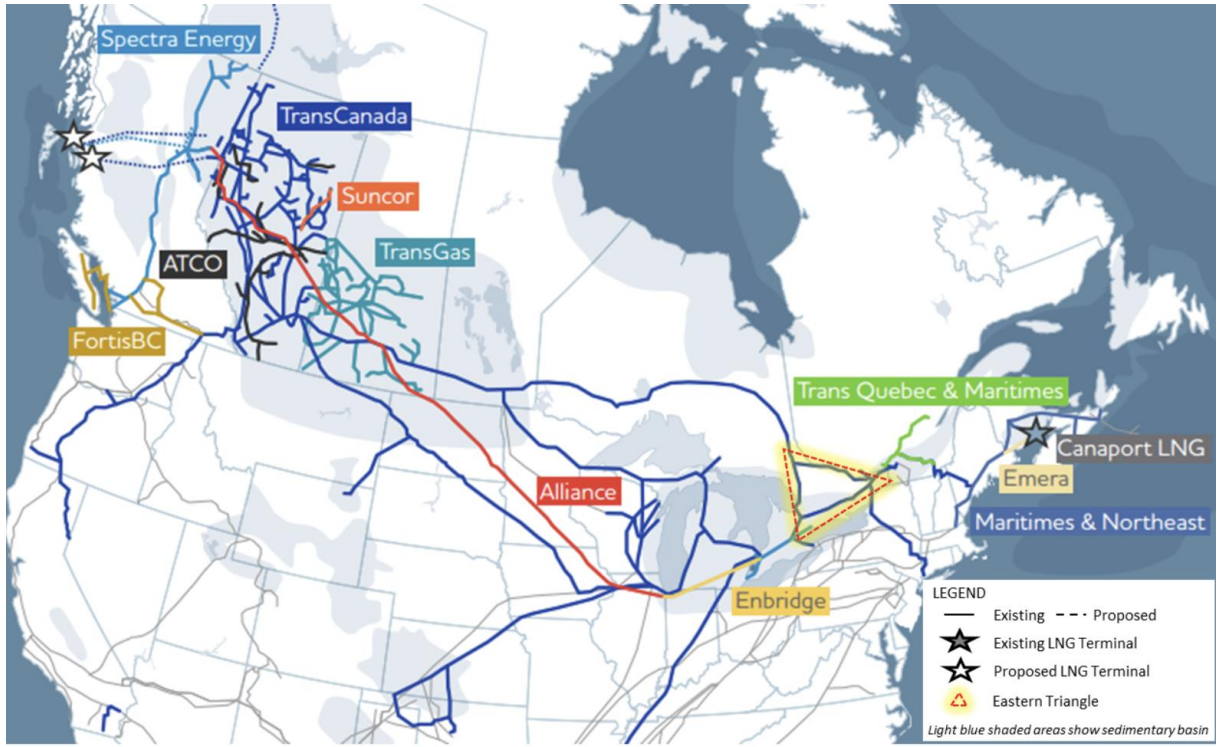




THERMOLIFT
The Future of Clean Energy

Preserving + Enhancing the Asset Value of the Gas Distribution Network

- Optimization of gas network with lower carbon footprint.
- Solving the challenges faced by electrification.
- Electrification is the highest cost alternative for heating in cold-climates.
- Non-pipe solution for capacity constrained grid.
- Rapid low-cost deployment.
- Gas energy efficiency integrates renewable energy.
- A catalyst to a low carbon future.



THERMOLIFT
The Future of Clean Energy

www.thermoliftenergy.com

ThermoLift—Societal Benefits

Hydrogen-Ready

- Pollution Free, **Zero Carbon**
- ThermoLift is the next-generation technology for **hydrogen-based economy**.
- Electrification will require **2x-4x** the capacity of existing electric grid, with TC3, no new grid infrastructure will be needed.

Global Warming-Free

- Current Standard up to **25%** allowable leak rate environmentally harmful refrigerants per EPA standard.
- Refrigerants (HFC's) are "powerful greenhouse gases, having a global warming potential (GWP) **1,000x** stronger than CO2."

Clean

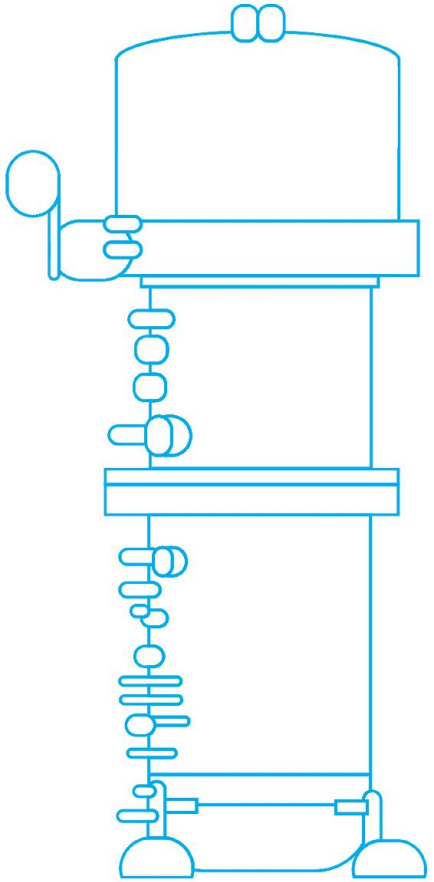
- **50% reduction** in GHG emissions from building HVAC
- **No Nox** emissions—Blue Angel Award
- Each ThermoLift will **eliminate 50 tons** of CO2 every 10 years vs. stock equipment.

www.thermoliftenergy.com

For more information, please contact:

THERMOLIFT, Inc.

Paul Schwartz, *Director & Co-Founder*
1000 Innovation Road, Suite 209,
Stony Brook, New York 11794
Phone: 631.779.1370



WE ARE HOMY

HOMY

WHO WE ARE?

HOMY SA with head offices in Lugano, in the Italian part of Switzerland, and numerous branches in **Italy** and **Canada**, **HOMY** is an international company specializing in:

PREFAB: Light steel frame constructions based on modular prefabricated systems.

HVAC: Supplier of heating and cooling products for residential, commercial and industrial projects.

SCAFF: Ring lock and frame scaffolding systems, as well as a comprehensive range of custom-made components and accessories for the building industry.

HOMY HVAC SOLUTIONS

Homy Bulding Solutions Inc. is a Toronto-based engineering firm that specializes in designing and supplying air conditioning equipment.

In cooperation with reputable manufacturers around the world, the company has always strived to provide top quality heating and cooling equipment.

Our GOAL is to introduce equipment with:

- Less Energy Consumption
- Higher Efficiency

The company has done extensive research on **gas heat pump (GHP)** systems over the past years and has achieved remarkable results.

HOMY HVAC SOLUTIONS

- Benefitting from a strong network of **local engineers** and **contractors** with the focus on thermally driven heat pumps.
- Activities include: **Design**, **Procurement** and **Executing** the commercial and residential heat pump related project.
- **HOMY** has secured the representation of Vicot for the GAHP equipment in North America

HOMY Represents Vicot Gas Heat Pumps

HOMY BUILDING SOLUTIONS

VICOT GAHP

HOMY has conducted an exclusive contract with **VICOT** from China to supply high efficiency **GAHP** system in Canada and USA.

HOMY is responsible for :

- ✓ Sales
- ✓ Commissioning
- ✓ After Sales Service

VICOT

VICOT INTRODUCTION

Established in 2005, **VICOT** Air Conditioning Co. is a high-tech corporation specialized in R&D, production, sales and service of HVAC and renewable energy products.

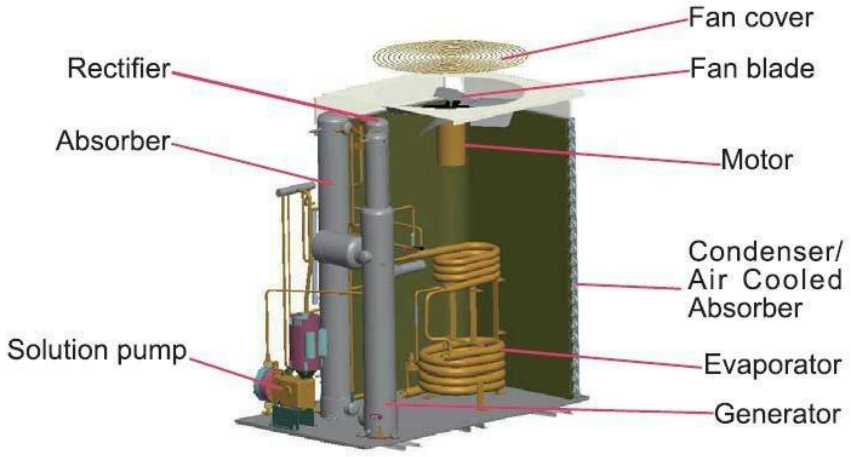
- ✓ **150,000 m²** Factory area
- ✓ 7 production lines for **GAHP**
- ✓ more than **2,000** employees

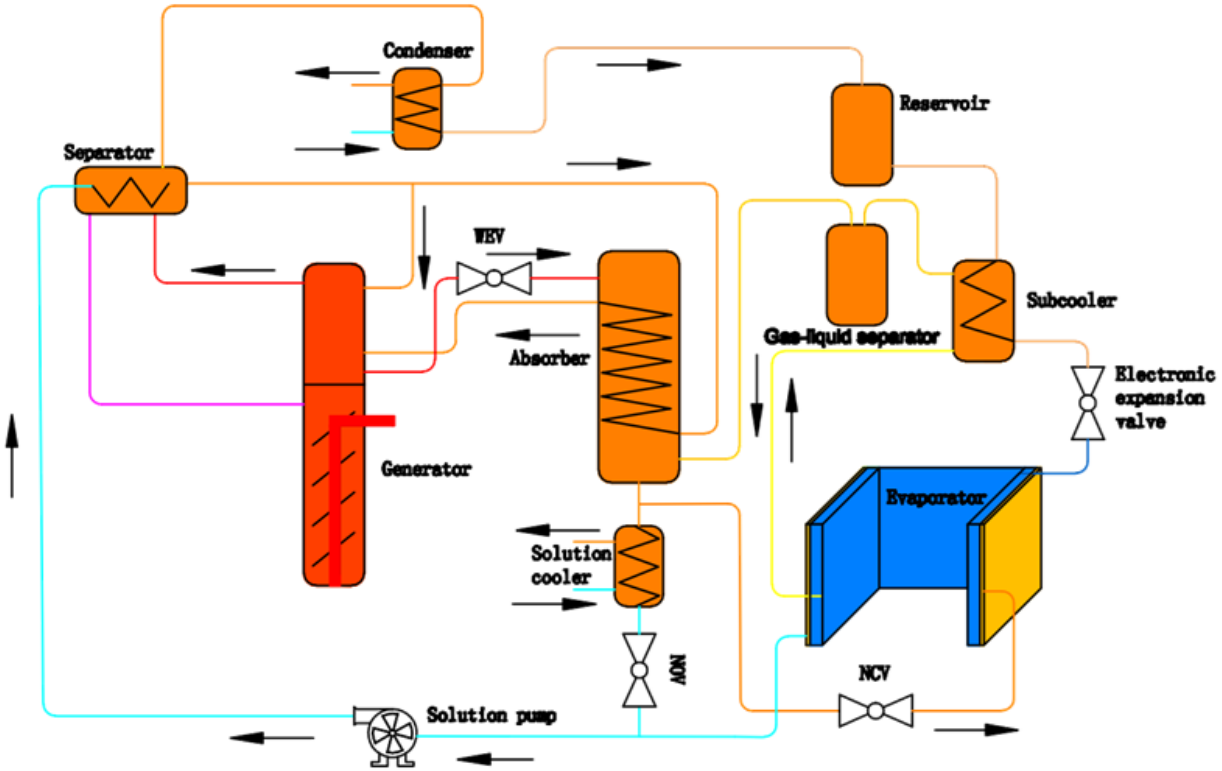
VICOT has 100 Million USD asset and design annual production value reaches 700 Million USD.

VICOT installed more than **20,000 units** of GAHP units in China domestic market from 2018 to 2020.

VICOT GAHP

The air cooled gas absorption heat pump **(GAHP)** is a high efficiency gas-fired reversible chiller for residential and light commercial **Space Heating** and **Supplying domestic hot water** demands.





Wide Range of Applications:

Natural Gas

Air Energy

VICOT GAHP UNIT

Floor heating

Radiator

DHW

SPA

WHY GAHP

HOMY BUILDING SOLUTIONS

Gas Boiler, Electric ASHP, and GAHP

Electrical heat pumps (ASHP) have much less environmental damage than conventional boilers. However, the higher cost of electricity than gas prevents the replacement of electrical heat pumps with conventional boilers.

GAHP with apx 160% efficiency is an optimum solution compare to the boiler or EASHP option.

GAHP utilize **low-cost fuel**.

Heating performance of electrical heat pump at **low temperature is poor.**

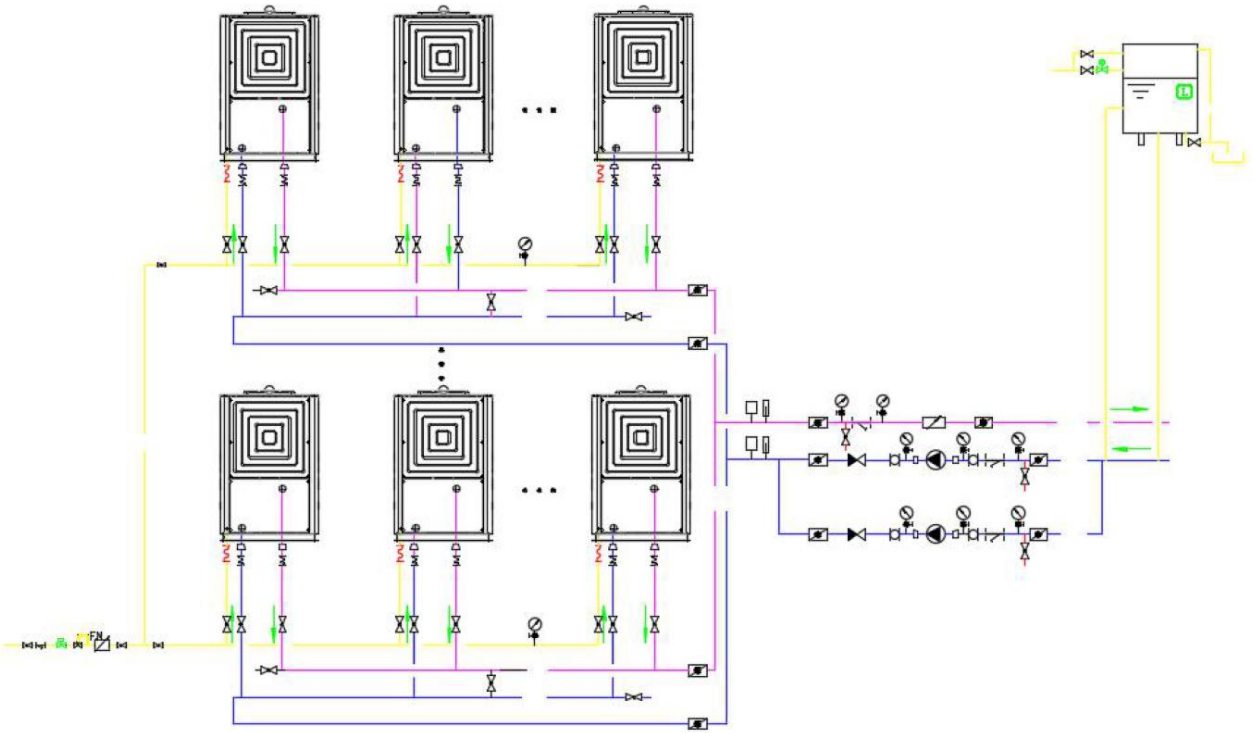
GAHP is a suitable **solution** to:

- **Reduce energy consumption**
- **Reduce CO_2 emission**
- **Payback for end-user in long-term**

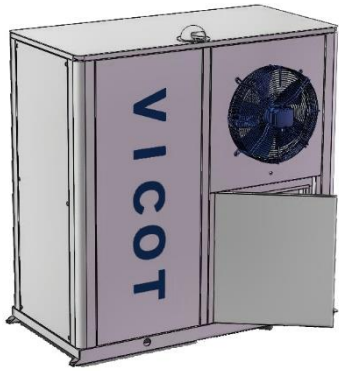
VICOT GAHP

Principle & Feature:

- ✓ High efficiency
- ✓ Wide operation ambient temperature range
- ✓ **Capable of operation in ambient -30 C**
- ✓ Quick full output
- ✓ Intelligent defrost
- ✓ Durable in low ambient temp.
- ✓ **Stepless adjustment (modulation capacity control)**
- ✓ Low noise
- ✓ Suitable for various terminal
- ✓ for district heating, no secondary network
- ✓ Remote control via App



CAPACITY RANGE



Residential

V10: 10KW [34 MBH] GAHP*
V20: 20KW [68 MBH] GAHP

* V10 will be launched in 2022

Residential/ Commercial

V65: 65KW [221 MBH] GAHP
V85: 85KW [290 MBH] GAHP

Combo Type – Higher Capacities

V105: 85KW [290 MBH] GAHP
+20KW [68 MBH] BOILER

V120: 85KW [290 MBH] GAHP
+35KW [119 MBH] BOILER

V140: 85KW [290 MBH] GAHP
+55KW [187 MBH] BOILER

HOMY RELATIONSHIP WITH THE LOCAL UTILITIES and GTI

- As a trusted service provider for the GAHP technology.
- Helping and **PILOTING** on numerous projects and **LAB TESTING**.
- Helping to develop **INCENTIVES** for market **transformation** on GAHP.

VICOT GAHP CERTIFICATION PATHWAY

The CSA and UL certification process of **VICOT GAHP** is on its way.

The **V65** is expected to complete lab testing at GTI by September 2020 and will be commercialized by the end of 2021.

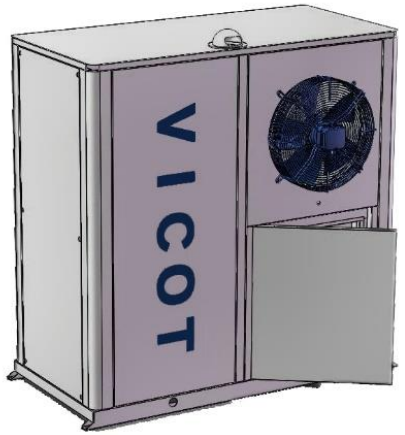
Lab testing of **V20** is scheduled to start by September 2021 and commercialization of this residential model is expected to be in mid of 2022.

PACKAGE SOLUTION - RESIDENTIAL

In residential sector **HOMY** intends to offer clients integrated **GAHP** with **AHU** as a packaged.

Integrating GAHP with AHU advantages and DHW tank (Packaged solution):

- Convenient Solution for the end-users and the contractors.
- Using a sophisticated AHU to perfectly match with GAHP and benefiting from state of art IoT.
- **HOMY** provides **installation and after sales service** for the integrated system and **contractors training.**



+

TECHNICAL INFORMATION V20 AND V65

Item		V20 : 20KW GAHP		V65 : 65KW GAHP	
		Unit	Specification	Unit	Specification
Nominal heating capacity		KW [MBH]	19.2 [65]	KW [MBH]	65.8 [224]
Water flow rate		m3/hr [GPM]	>=1.6 [7]	m3/hr [GPM]	>=4 [17]
Water side pressure drop		kPa [Psi]	>=20 [>=2.9]	kPa [Psi]	>=60 [>=8.7]
Minimum water inlet temp.		C [F]	9 [48.2]	C [F]	9 [48.2]
Maximum water outlet temp.		C [F]	65 [149]	C [F]	65 [149]
Ambient temp.	Max.temp.	C [F]	43 [109.4]	C [F]	43 [109.4]
	Min.temp.	C [F]	-30 [-22]	C [F]	-30 [-22]
Rated thermal input		KW	10	KW	33.9
Thermal input adjustment range		KW	3.8 ~ 11.3	KW	14 ~ 37.7
Rated natural gas consumption		m3/hr [therm/hr]	1.06 [0.38]	m3/hr [therm/hr]	3.6 [1.29]
Gas consumption range		m3/hr [therm/hr]	0.4 ~ 1.2 [0.14 ~ 0.43]	m3/hr [therm/hr]	1.5 ~ 4.0 [0.54 ~ 1.44]
Power supply			220V/1Ph/60Hz		240V/3Ph/60Hz
Electricty power input		KW	0.4	KW	1.25
Unit weight		kg [lb]	260 [573]	kg	980 [2160]
Noise		dB(A)	40	dB(A)	54
Pipe size	Water pipe (threaded)	In	Rc 1 (DN25)	In	Rc 1 1/4
	Gas pipe (threaded)	In	RC 1/2 (DN15)	In	RC 1/2
Unit dimenssion	Length	mm [in]	1200 [47.2]	mm [in]	2380 [93.7]
	Width	mm [in]	700 [27.5]	mm [in]	1380 [54.3]
	Height	mm [in]	1300 [51.1]	mm [in]	2200 [86.6]

VICOT HOMY BUILDING SOLUTIONS

TECHNICAL INFORMATION OF COMBO GAHP AND CONDENSING BOILER

HOMY BUILDING SOLUTIONS

VICOT

What is Combo GAHP?

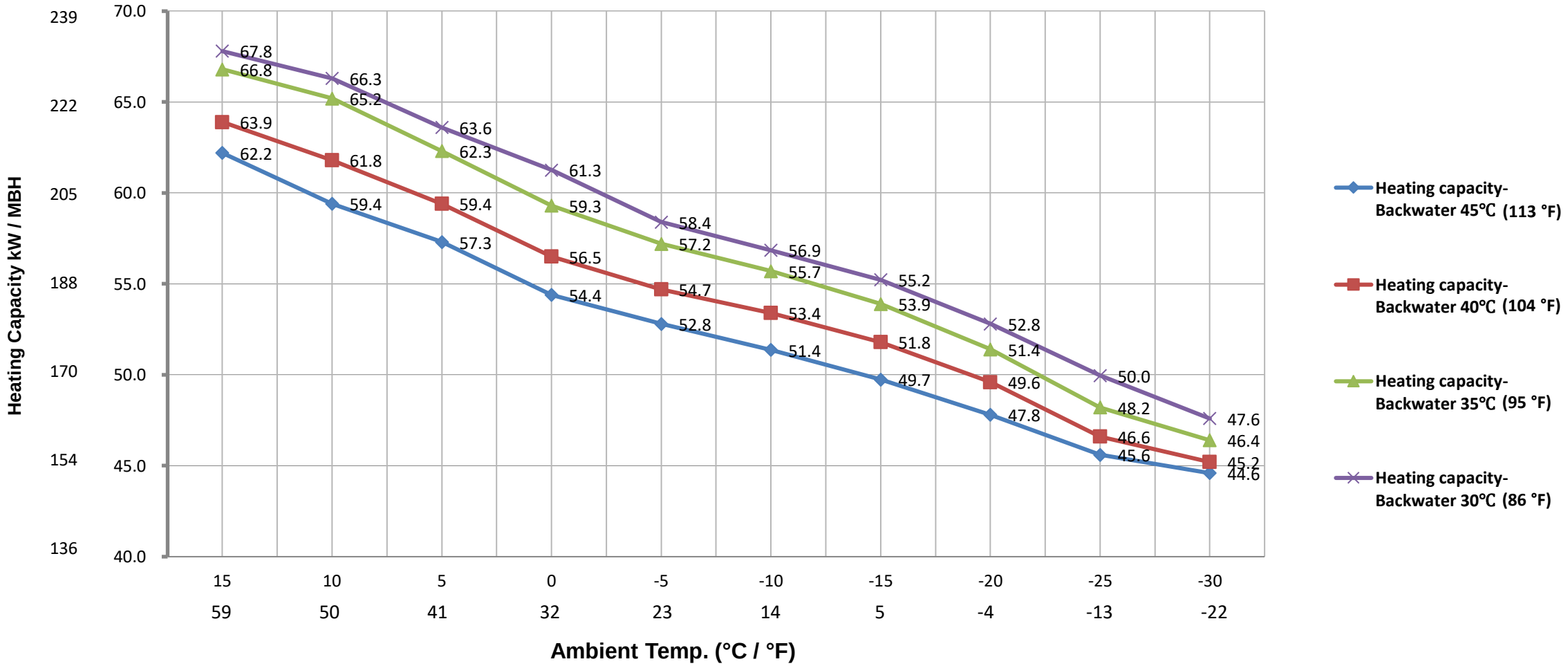
Reaching the higher capacities with base load of GAHP integrated with condensing boiler.

Item		Unit	Specification			
			V85	V105	V120	V140
Nominal heating capacity		KW [MBH]	85 [290]	105 [358]	120 [409]	140 [477]
Water flow rate		m3/hr [GPM]	6 ~ 8 [26.4 ~ 35.2]			
Water side pressure drop		kPa [Psi]	>80 [11.6]			
Water return tempreture		C [F]	9 [48.2]			
Water outlet tempreture		C [F]	60 [140]			
Ambient temp.	Max.temp.	C [F]	20 [68]			
	Min.temp.	C [F]	-30 [-22]			
Rated thermal input power		KW	41.85	60.25	74.4	93
Rated natural gas consumption		m3/hr [therm/hr]	4.5 [1.62]	6.5 [2.34]	8 [2.88]	10 [3.6]
Power supply			240/3Ph/60Hz			
Electricity power input		KW	1.55	1.75		
Unit weight		kg [lb]	1390 [3064]	1490 [3284]		
Noise		dB(A)	54			
Pipe size	Water pipe (threaded)	In	Rc 1 1/4 (DN32)			
	Gas pipe (threaded)	In	Rc 1 (DN25)			
Unit dimenssion	Length	mm [in]	2380 [93.7]			
	Width	mm [in]	1380 [54.3]			
	Height	mm [in]	2200 [86.6]			

Running curve of V65

Heating Capacity

Working data and curve of ambient temperature and water temperature change – **V65**



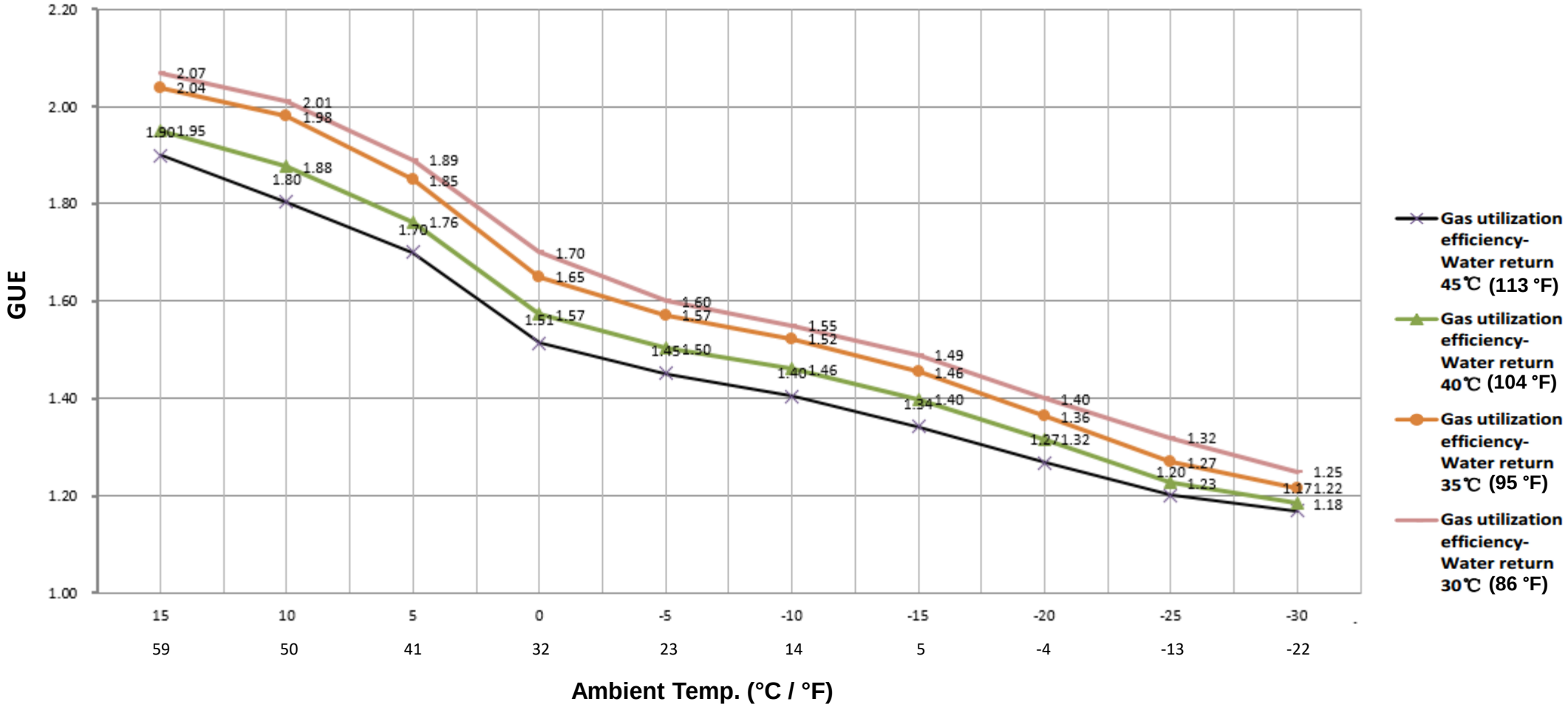
Running curve of V65

HOMY BUILDING SOLUTIONS

VICOT

GUE

Working data and curve of ambient temperature and water temperature change – **V65**



CASE STUDY

Analysis of Changping Pioneer Home Project

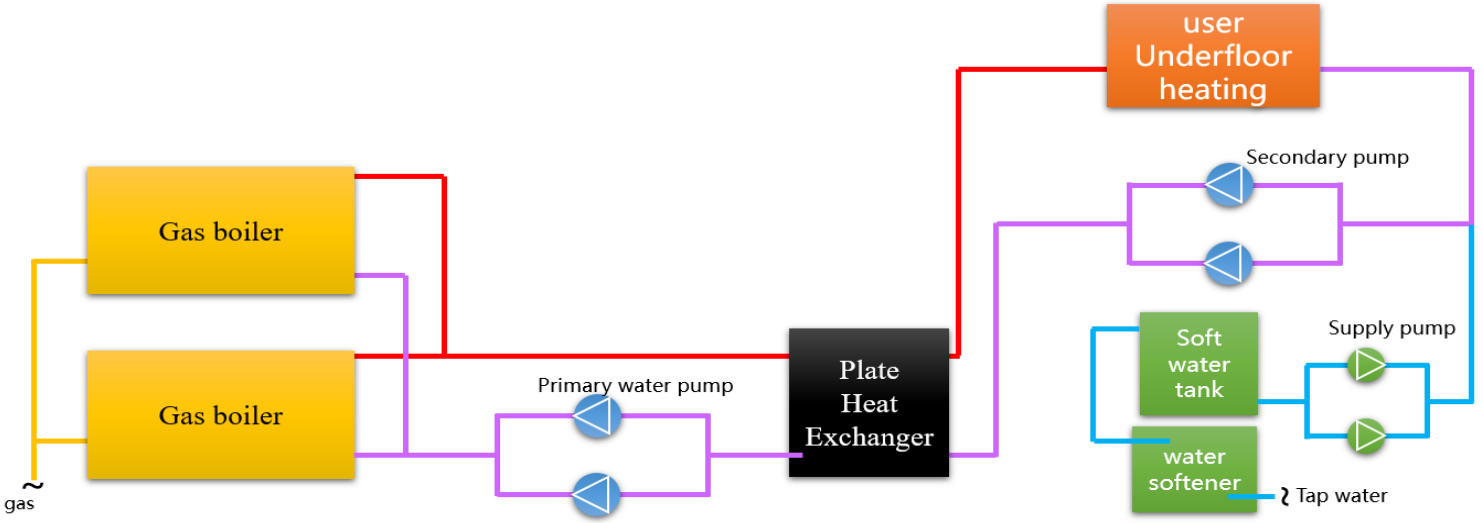
HOMY

Project Overview	
Project name	Pioneer Homestead
Project location	Changping district, Beijing
Project nature	Civil residential renovation
Original heat source form	Gas boiler
Heating area	34,587 m^2 [372,291 ft^2]
Total heating load	1,318.2kW [4,497,885 Btu/hr]
Equipment Quantity	24 sets
Terminal form	Floor radiation
Designed supply and return water temperature	45/35 ℃ [113/95 °F]
Equipment layout location	Boiler room roof

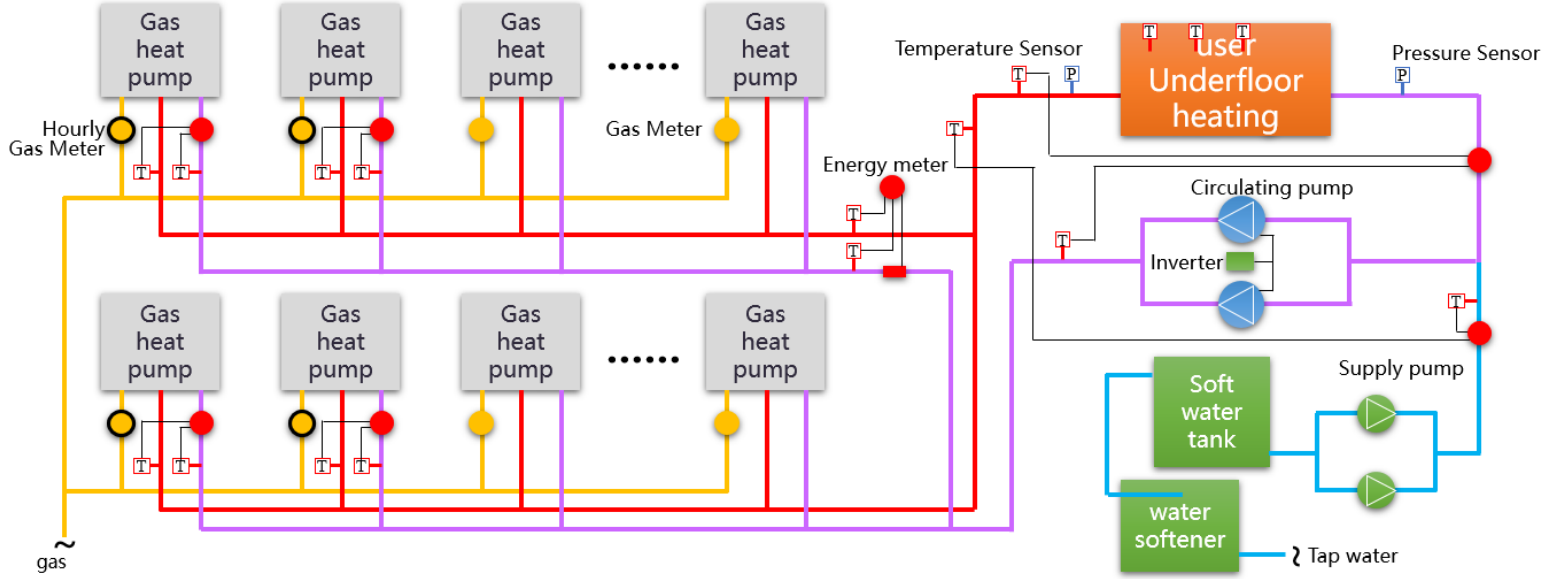
Legacy System			
Device	**Quantity**	**Parameter**	**Note**
Gas boiler	1sets		Disable
Gas boiler	1sets		Disable
Primary water pump	2sets	Flow 200 m^3/h [880 GPM] Head 25m (82ft)	One use, one preparation, disable
Secondary pump	2sets	Flow 300 m^3/h [1,320 GPM] Head 35m (114ft)	One use, one preparation, used as system circulating water pump

Retrofit System			
Device	**Quantity**	**Parameter**	**note**
Gas heat pump	24sets	Rated thermal power 64kW × 24 = 1.54MW [5,254,698 Btu/hr]	
Circulating pump	2 sets	Flow 300 m3/h [1,320 GPM] Head 35m [114ft]	One use, one preparation, using the secondary pump of the original system

Legacy system



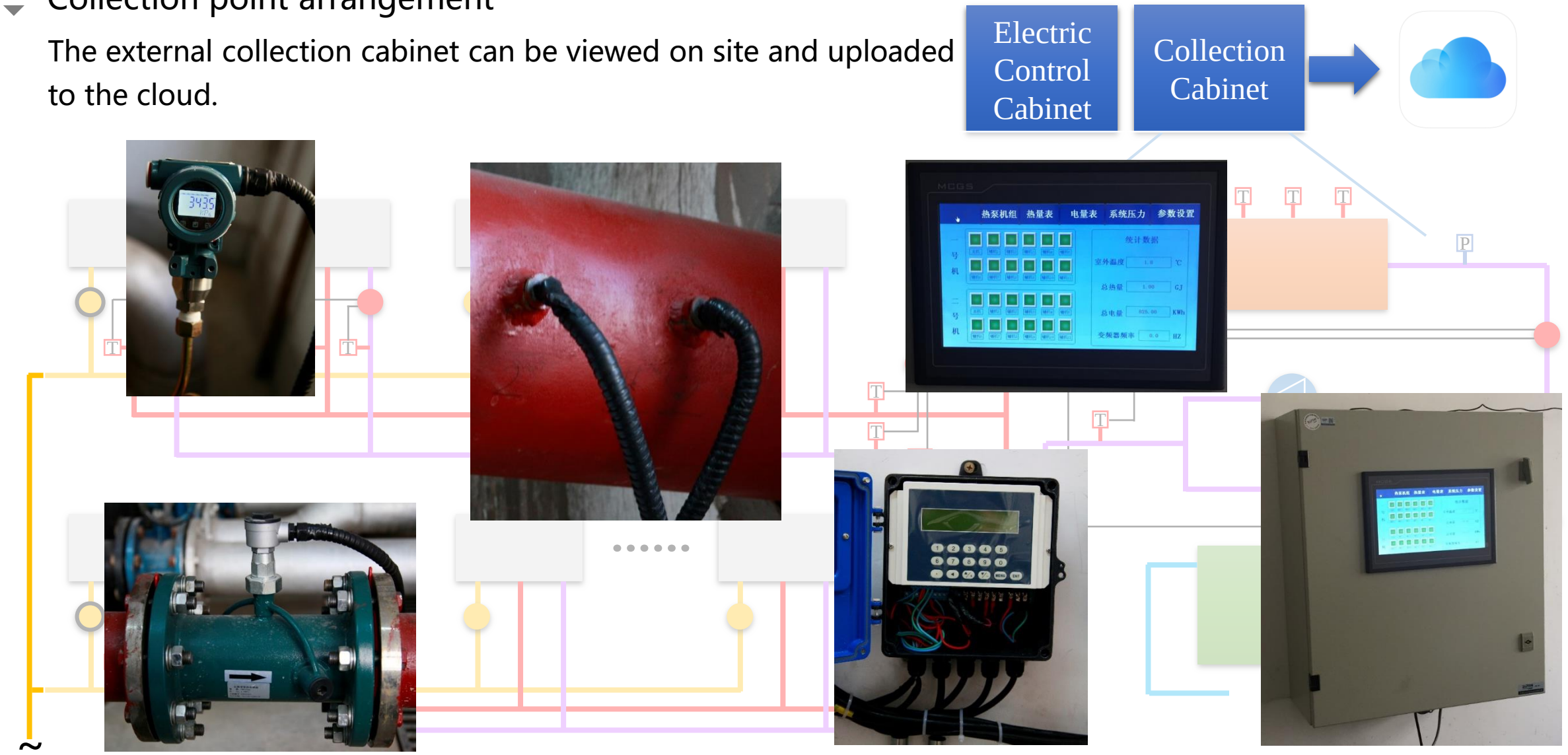
Retrofit system



Retrofit system

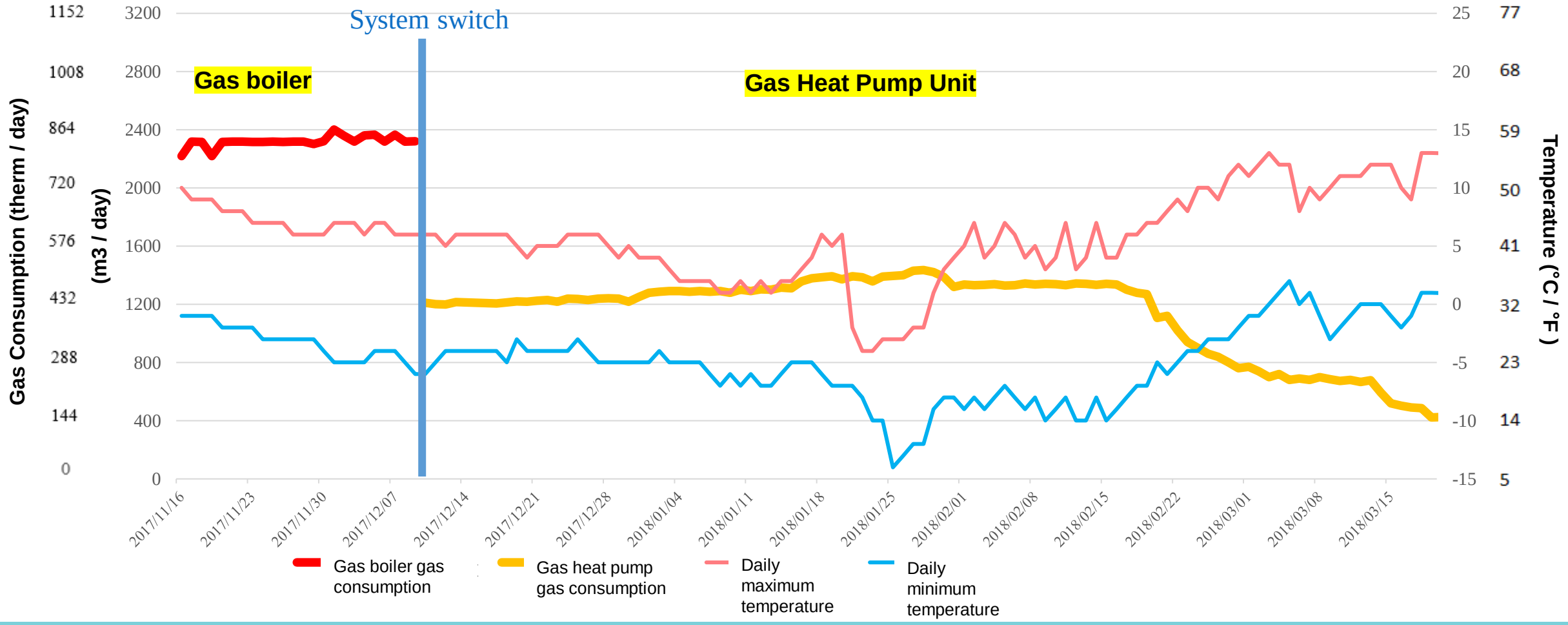
Collection point arrangement

The external collection cabinet can be viewed on site and uploaded to the cloud.



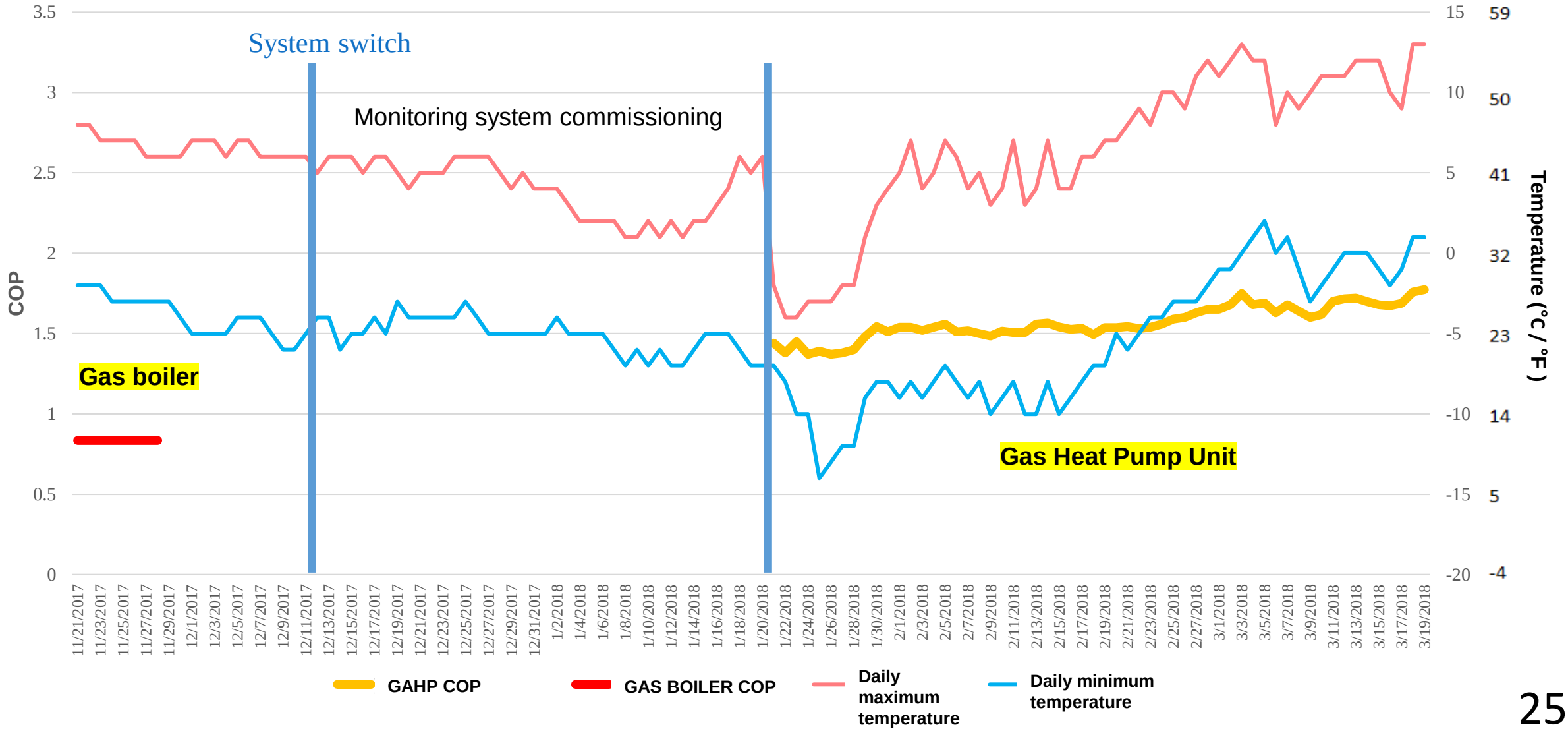
Run analysis

Comparison of gas usage



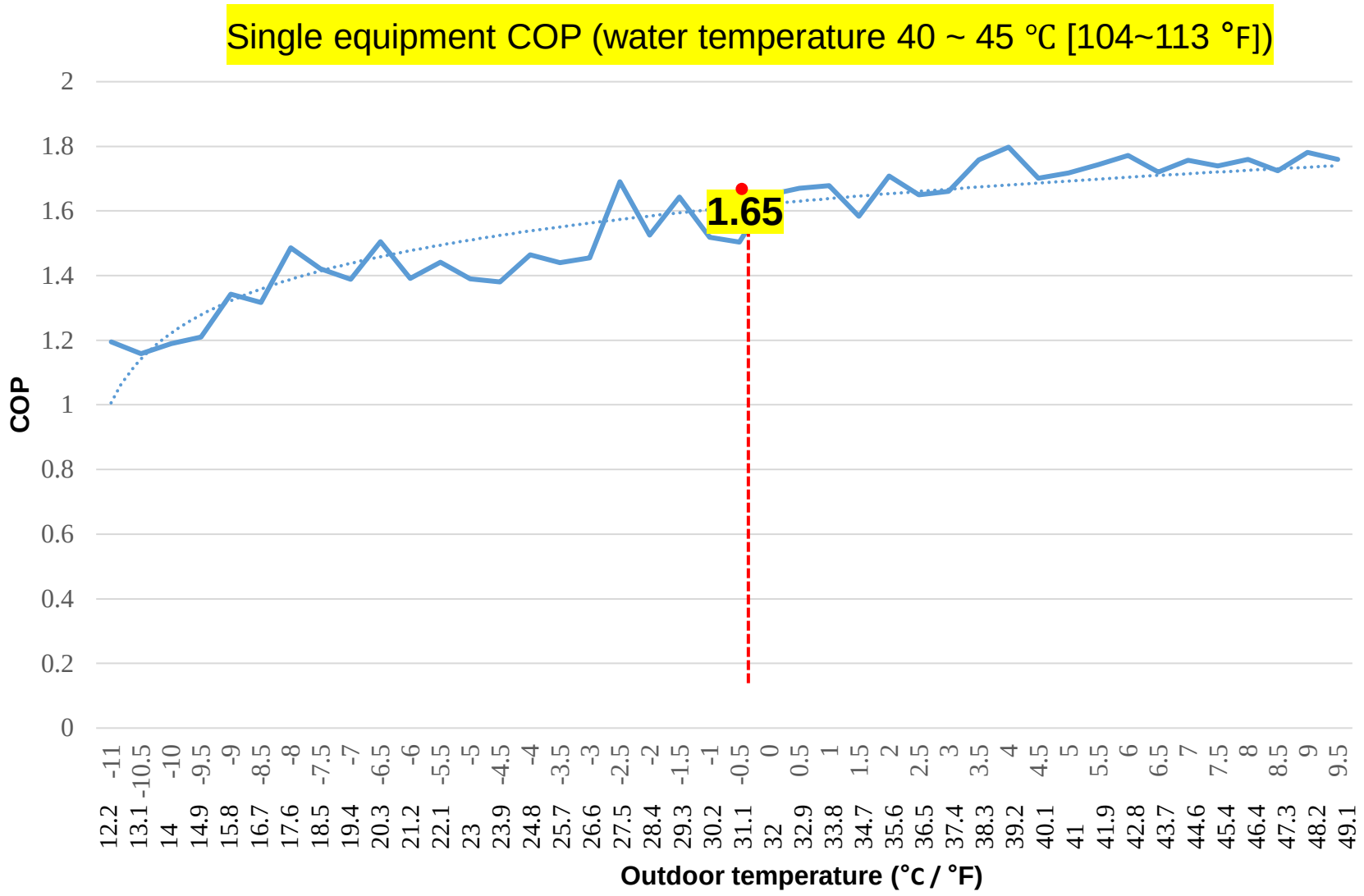
Run analysis

COP comparison of gas heat pump unit and gas boiler



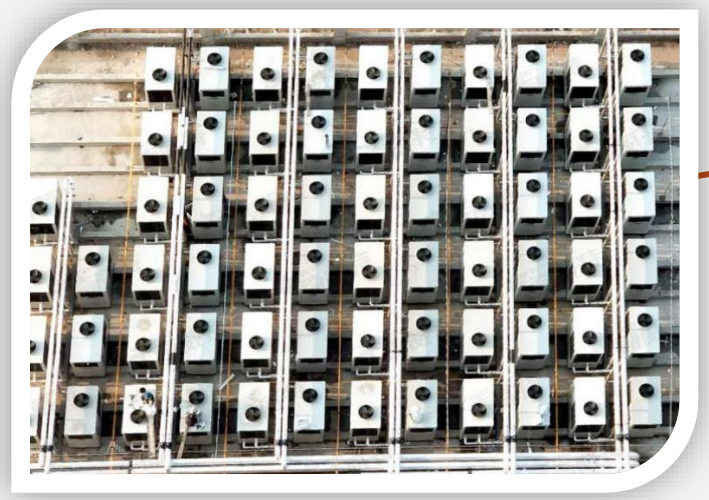
Run analysis

COP analysis of gas heat pump equipment



REFERENCES

VICOT REFERENCES



Community	Building area (m²)	Terminal type	Nos. of GAP (SETS)	Heating equipment
Yuanmingxinyuan	140000	Floor heating	97	GAP
Jinyulanwan	84000	Floor heating Radiator	48	GAP
Road Branch of Communication Bureau	30000	Radiator	28	GAP+gas boiler
No. 4 middle school of Huanghua	30000	Radiator	26	GAP+gas boiler
Living building of real estate bureau, Huanghua	20000	Radiator	16	GAP+gas boiler
Nursing home of Huanghua	18000	Floor heating	14	GAP+gas boiler
Living building of Food Bureau	24000	Radiator	20	GAP+gas boiler
Kangxinyuan	60000	Floor heating	38	GAP+gas boiler
Jingang Garden	40000	Floor heating	24	GAP
Medical company & its commercial building	12000	Radiator	10	GAP+gas boiler
Dormitory of Tgood industrial park	42000	Radiator	35	GAP
Wenxindasha	60000	Floor heating	45	GAP
Guojiaxin Village	12000	Floor heating	12	GAP
Sandu community	20000	Floor heating	15	GAP
Zhongchenguanjingyuan	25000	Floor heating	18	GAP+gas boiler

HOMY References

Pilot Project in Toronto

Location:
Toronto, Ontario, Canada
Multi Residential Building
9-storey, 51 apartment units

VICOT GAHP model:
V65, Capacity 65KW

Application:
Supply domestic hot water

HOMY References

Legacy System for DHW:

- One unit 630 KBtu Boiler
- Three units 120 Gal Tank

Retrofit System for DHW:

- One Vicot V65
- Capacity 65KW

For this project Homy provided design drawings and the installation.

Unit will be commission by the end of June 2021

Dario Roustayan
droustayan@homy.build

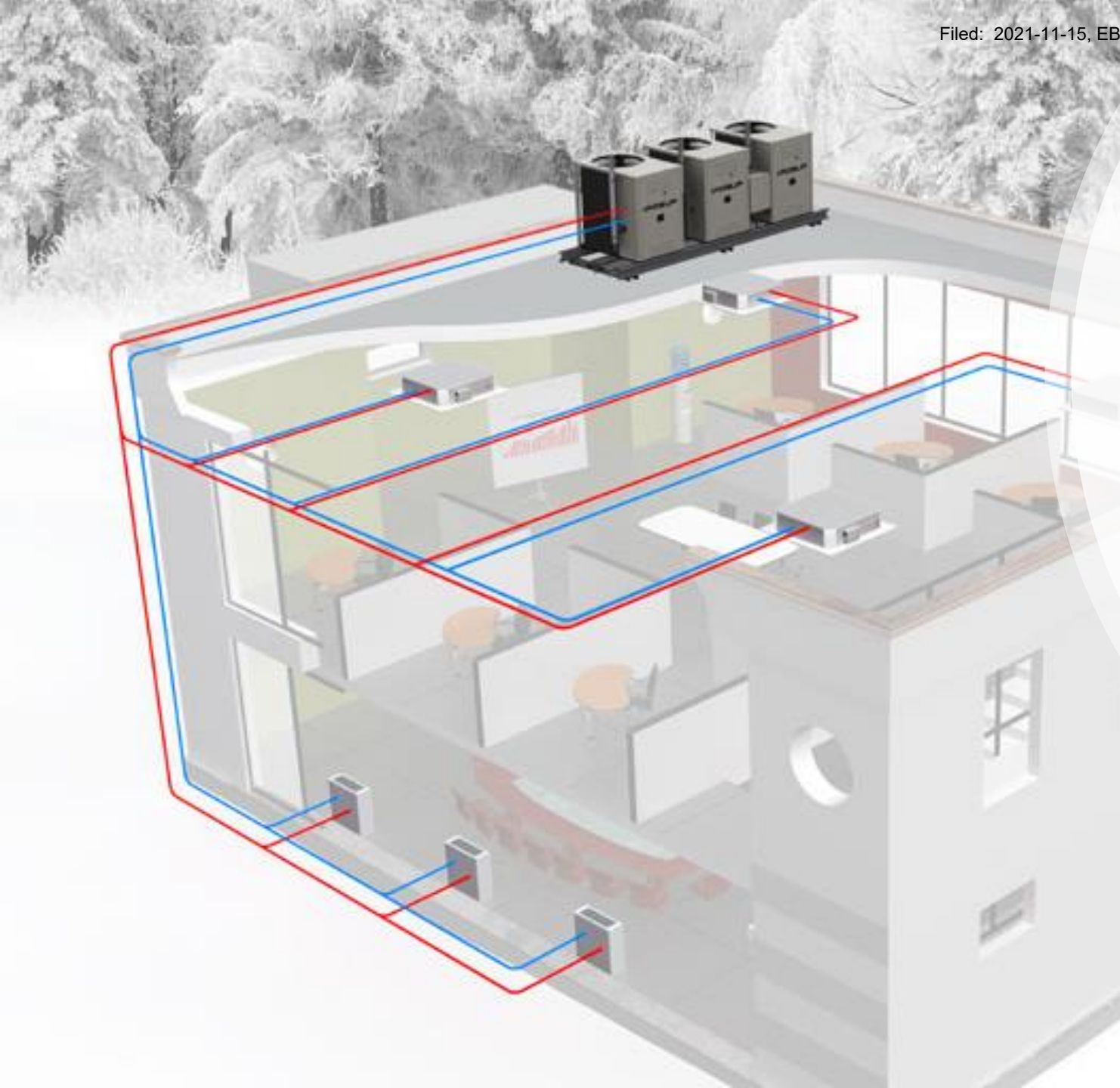
Houman Ameri
h.ameri@homybuild.ca

Q&A

Do You Have Any Questions?

Feel Free To Ask.


ROBUR®
caring for the environment
GAS-FIRED
ABSORPTION HEAT PUMPS & CHILLERS
www.roburcorp.com



Robur manufactures air and water sourced chilled and hot water production systems using natural or propane gas as the main energy source.

Each module provides 5T cooling and/or 120,000 Btu heating.

Individual modules can be connected together to match building capacities.

ROBUR
caring for the environment

Gas-Fired Absorption Heat Pumps & Chillers

- Modular and Redundant Design –
  No System Downtime
- Up to 80% reduction in electrical requirements –
  Single Phase Operation
- Highest Gas Heating Efficiency Available –
  Exceeding 100%
- Natural Refrigerant -
  Global Warming Potential = 0
  Ozone Depletion Potential = 0

ROBUR®

caring for the environment

ROBUR MISSION

Robur is dedicated to dynamic progression in research, development and promotion of safe, environmentally-friendly and energy-efficient products, through the commitment and caring of its employees and partners.

Founded in 1956

Corporate Headquarters:
Zingonia/Verdellino (BG) – Italy 300,000 sq. ft. Facility

North American Sales & Distribution:
Robur Corporation -Evansville, IN

Employees: Over 250 Globally

Annual R & D Investment: 8
7%+ of sales

Installations in more than 80 Countries

Servel 1902-1953

ARKLA 1954-1984

PREWAY 1984-1987

Dometic 1987-1991

SERVEL ROBUR 1991-2003

ROBUR 2003-Present

30

1991 - 2021

65

1956 - 2021

Proven Technology

Currently Gas Heat Pumps are viewed as an emerging technology.

Full production and commercialized units with all the necessary approvals have been available to North America since **2006**.

Many efficiency mandates set for the future can actually be achieved today.

Over 100,000 water-ammonia absorption chillers and Heat Pumps installations world-wide.

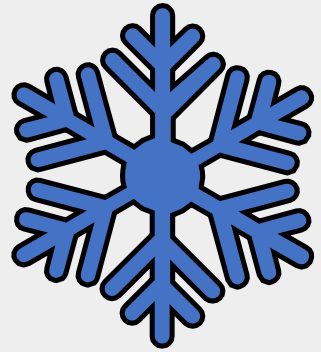
All equipment is in Stock in the U.S. – Evansville, IN

Don’t reinvent the wheel

- Installs like outdoor boiler
- Typical Hydronic System
- Multiple Zones
- Remote Installations
- Emitter Flexibility
- Component Flexibility

Advantages of Hydronic Heating & Cooling

Application flexibility – compatible with radiant systems, AHU's, ductless emitters, storage systems, + much more.



Greatly reduced refrigerant volume – no poisonous leaks indoors (ASHRAE 15), less environmental impact – extensive refrigerant piping common for VRF and DX systems.

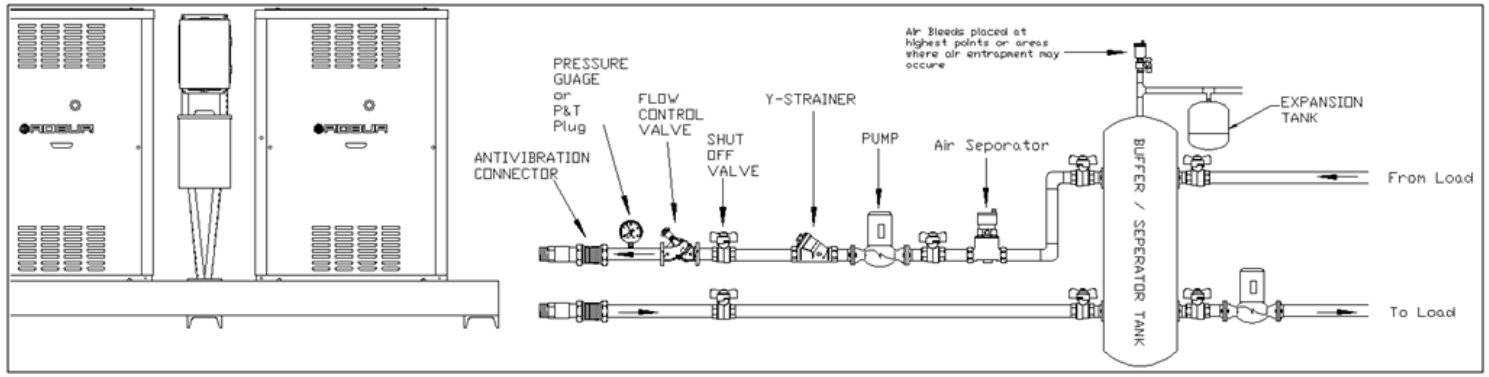
Phase out costs less – avoid replacing the entire system (refrigerant piping and all) that will be required if future refrigerant is not compatible with current system.

Materials flexibility – avoid copper cost required with VRF and DX systems – plastics & polymers can cost much less & easy to install.

INSTALLATION

Necessary / Recommended Hydronic components:

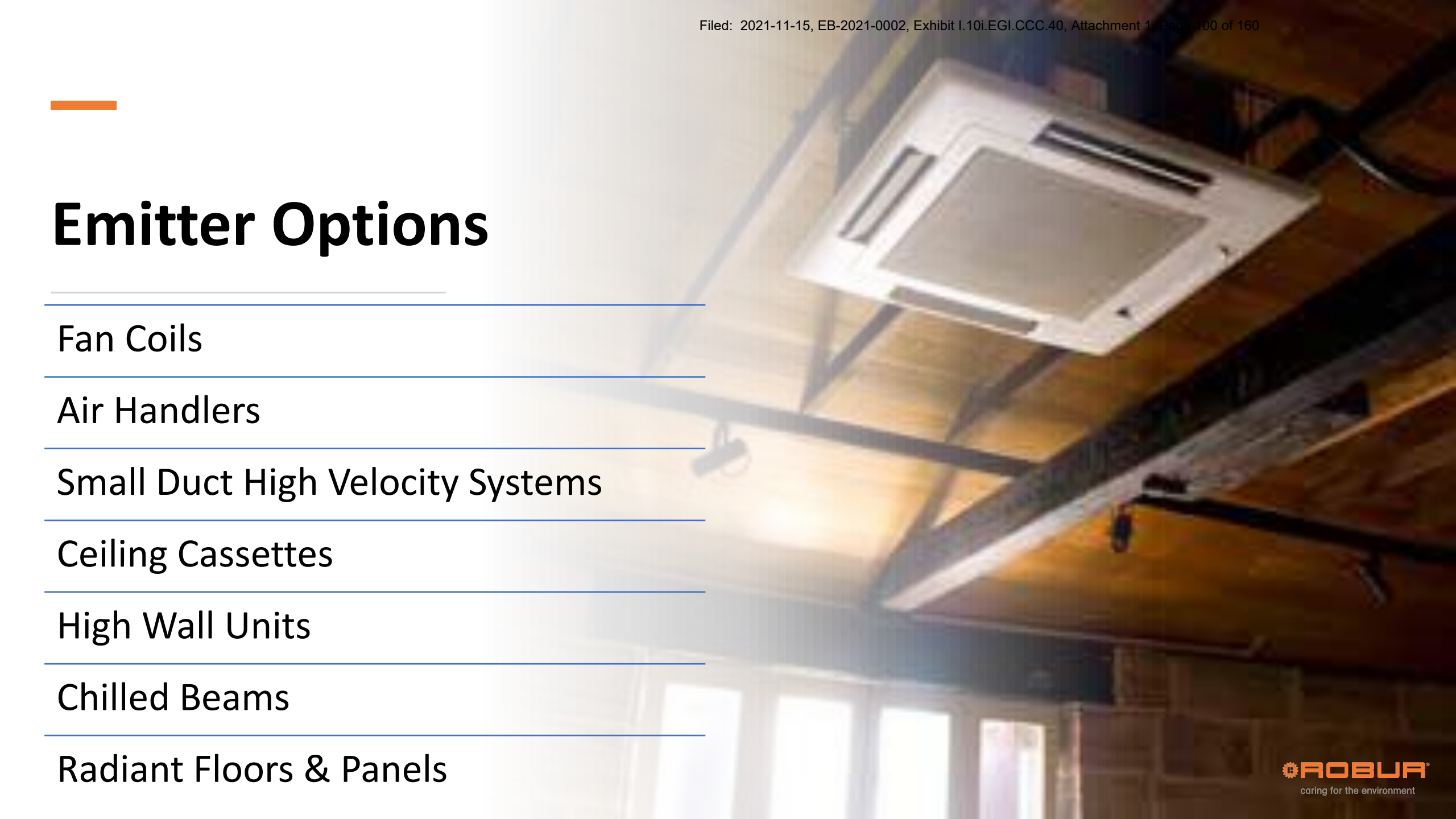
- Anti-Vibration / Flexible Connectors
- Pressure Gauge / PT Fittings
- Flow Control Valve / Circuit Setter
- Isolation / Shut Off Valves – Full Flow
- Water Strainer / Filter
- Water Pump(s)
- Air Separator / Air Bleeds
- Expansion Tank
- Buffer Tank
- Load By-Pass Valves – Not Shown
- 45 psi High Pressure relief valve to be installed on hot water systems – not to exceed 45 psi



ROBUR®
caring for the environment

Emitter Options

- Fan Coils
- Air Handlers
- Small Duct High Velocity Systems
- Ceiling Cassettes
- High Wall Units
- Chilled Beams
- Radiant Floors & Panels



ROBUR®

caring for the environment

PRODUCT OVERVIEW

HEAT PUMPS

GAHP A Air-Source Heat Pump (Heating Only)

GAHP AR Air-Source Reversible Heat Pump (Heating, Cooling and Supplemental DHW)

GAHP W LB Water Source Heat Pump Geothermal Applications (Heating, Cooling and Supplemental DHW)

GAHP W Water Source Heat Pump (Simultaneous Heating, Cooling and DHW production)

CHILLERS

ACF ST for residential/commercial/industrial cooling systems with chilled water down to 37.4 °F.

ACF TK for heavy duty use, for process systems and applications with chilled water down to 37.4 °F, for operation down to 10.4°F ambient temperature.

ACF HT for very hot climates, for residential/commercial/industrial cooling systems with chilled water down to 41 °F, with outside air up to 131 °F.

ACF LB for cooling systems with chilled water down to 14 °F, for operation down to 10.4°F ambient

ACF HR for residential/commercial/industrial cooling systems with chilled water down to 37.4 °F., plus free recovered hot water up to 176 °F (e.g. supplemental DHW production).

TARGET APPLICATIONS

- Limited Electrical Capacity
- Multi-Family
- Healthcare Facilities
- K-12 Education
- Higher Education
- Hospitality
- Restaurants
- Retail
- Data Center
- Mission Critical
- Satellite Buildings
- Grow Rooms
- Commercial Properties
- Office Buildings
- Churches
- Historical Buildings
- Assisted Living
- Custom Residential

ROBUR®
caring for the environment


ROBUR®
caring for the environment
HEAT PUMPS

GAS HEAT PUMPS AND RENEWABLE ENERGIES

GAHP units put together all the advantages of the two most common heating technologies

CONDENSING BOILER
ADVANTAGES
- Natural gas fired
- DHW supply
- Only 1/10 of electricity consumption in comparison to electrical heat pumps

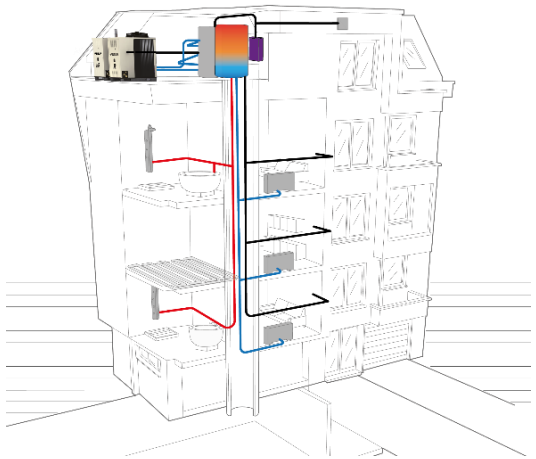
ELECTRIC HEAT PUMP
ADVANTAGES
- Use of renewable energies
- Cooling supply
- No need of mechanical room

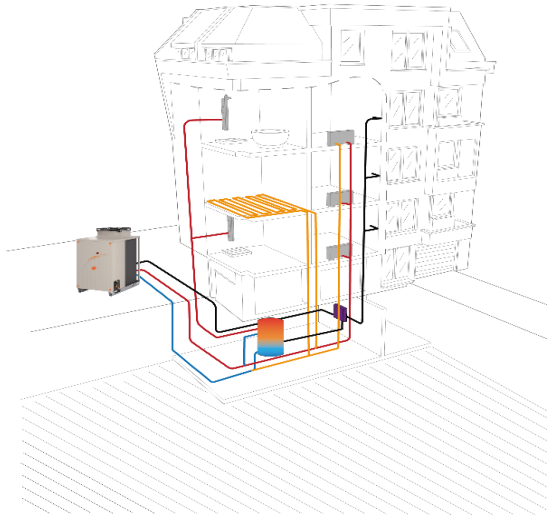
CONDENSING BOILER MINUS
- No renewable energy
- Efficiency lower than 100%
- Need for a boiler room

ELECTRIC HEAT PUMP MINUS
- High electricity consumption
- Use of fluids harmful for the environment
- Low efficiency at low outdoor temperatures

ROBUR
caring for the environment

Cooling | **Heating**





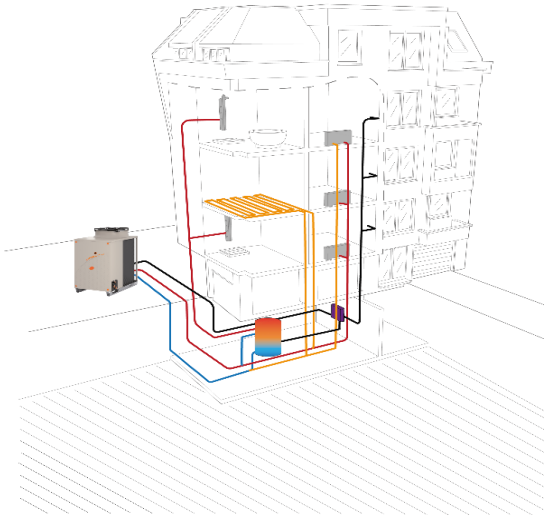
GAHP AR

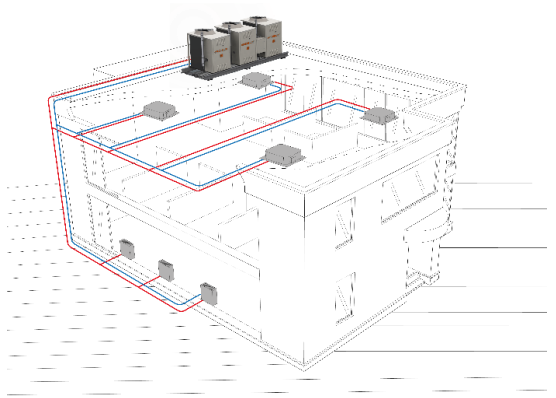
- Reversible Cooling & Heating System
- Provides *126%* Heating Efficiency at Nominal Conditions
- Ambient Operating Temperatures : 120°F to -20°F
- Max Outlet Water Temp 140°F
- Min Outlet Water Temp 37.4°F

ROBUR
caring for the environment

Heating / DHW

Heating





GAHP A

- Heating Only System
- Provides *129%* Heating Efficiency at Nominal Conditions
- Ambient Operating Temperatures : 113°F to -20°F
- Max Outlet Water Temp 140°F

ROBUR
caring for the environment


ROBUR®
caring for the environment
CHILLERS

ACF60 Absorption Chiller Series

ACF60 ST - STANDARD

5 Tons

Ambient Operating Temps: 120°F to 32°F

Min. Outlet Water Temp 37.4°F

ACF 60 TK - LOW AMBIENT

5 Tons

Ambient Operating Temps:120°F to 10.4°F

Min. Outlet Water Temp 37.4°F

ACF60 HT - HIGH AMBIENT

5 Tons

Ambient Operating Temperatures:

131°F to 32°F

Min. Outlet Water Temp 41°F

ACF60 LB
Low Brine Chiller

Used for Dehumidification and Medium Temperature Refrigeration

4 Tons

Ambient Operating Temps:
120°F to 10.4°F

Outlet Water Temps Down to 14°F

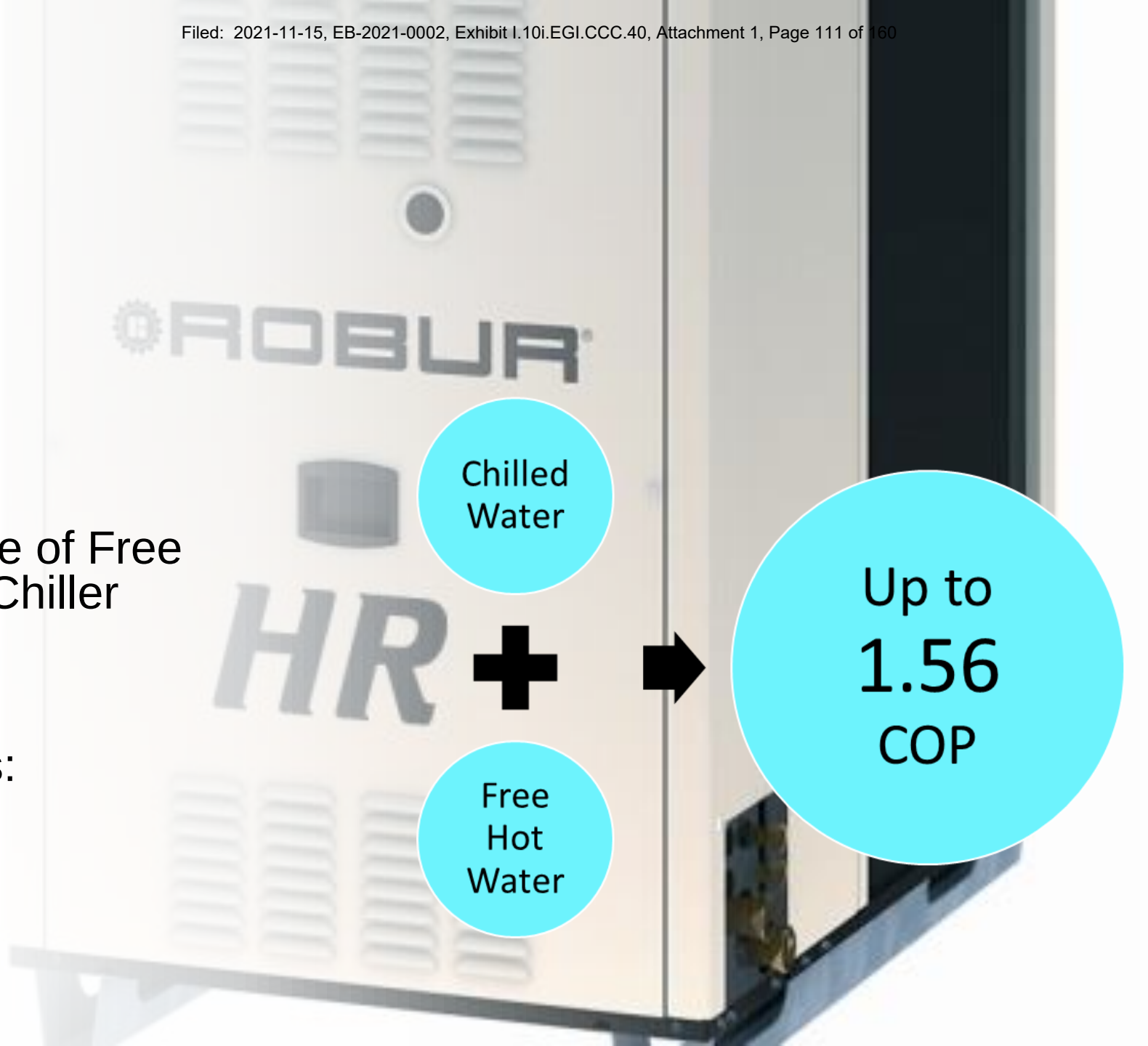
ACF60HR
Heat Recovery Chiller

5 Tons w/ Heat Recovery

Any Application Requiring the Use of Free Supplemental Hot Water During Chiller Operation

Ambient Operating Temperatures:
120°F to 32°F

Min. Outlet Water Temp 37.4°F



Individual Modules can be field installed to meet system capacity

Also Available as a Factory Assembled Modular Link

150T Cooling
3.6 mBTU Heating
27 kWh

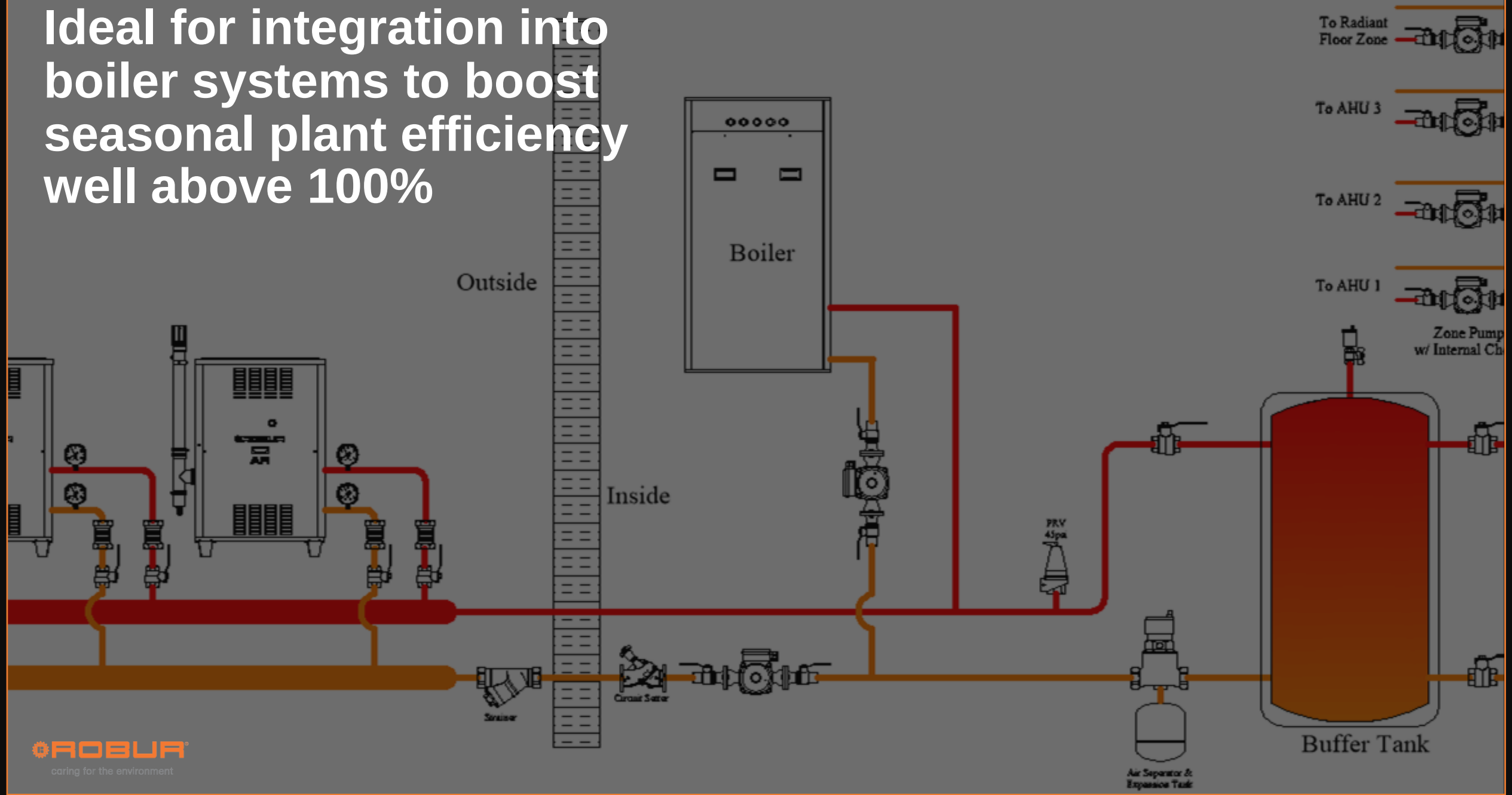
ROBUR
caring for the environment

30T Cooling
720,000 BTU Heating
5.4 kWh

ROBUR
caring for the environment


ROBUR®
caring for the environment
TANDEM
INTEGRATION

Ideal for integration into boiler systems to boost seasonal plant efficiency well above 100%



ROBUR
caring for the environment

Traditional Boiler Option

Advantages:

- Low Installation Cost
- 95% less electricity than electric heat pump option
- No Harmful Refrigerants
- DHW Production
- Traditional System - Familiar to all
- Long Life Expectancy

Disadvantage:

- Low Efficiency – Cannot Exceed 100%
- No Renewable Energy
- Indoor Installation
- Requires additional products and piping to achieve cooling

Robur Heat Pump Option

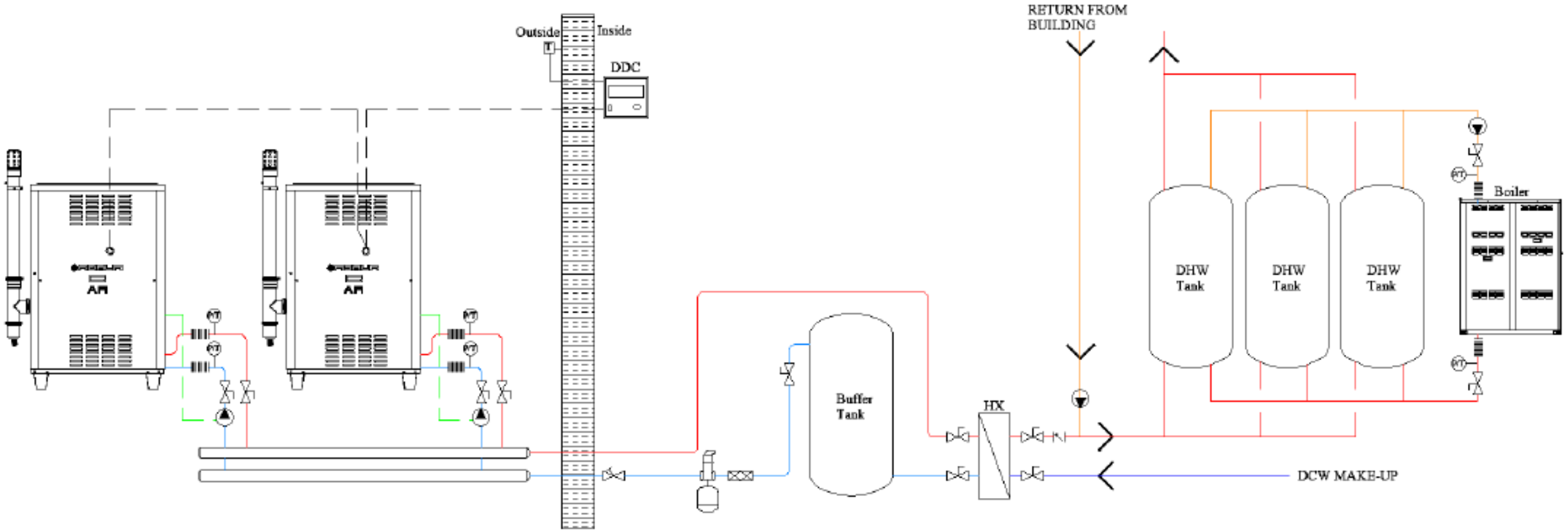
Advantages:

- Up to 140+% Efficient
- Reduced Operational Cost
- Carbon Reduction
- Modularity & Redundancy
- 80% less electricity than conventional chiller & boiler
- 0 ODP & 0 GWP
- And more

Disadvantage:

Tandem System Configuration

Robur Heat Pumps + Boiler



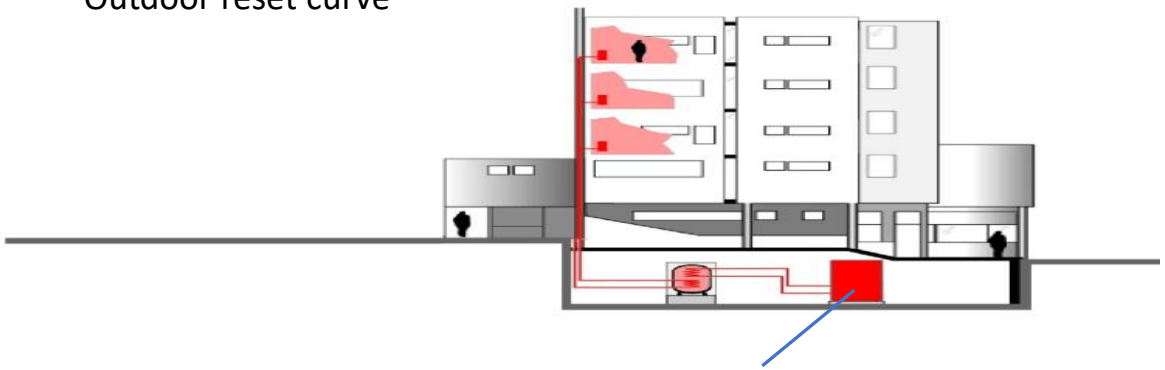
ROBUR
caring for the environment

Boston, MA - Design Temperature: 7°F - Building Load: 400,000 Btu/h - Design water temperature: 167°F

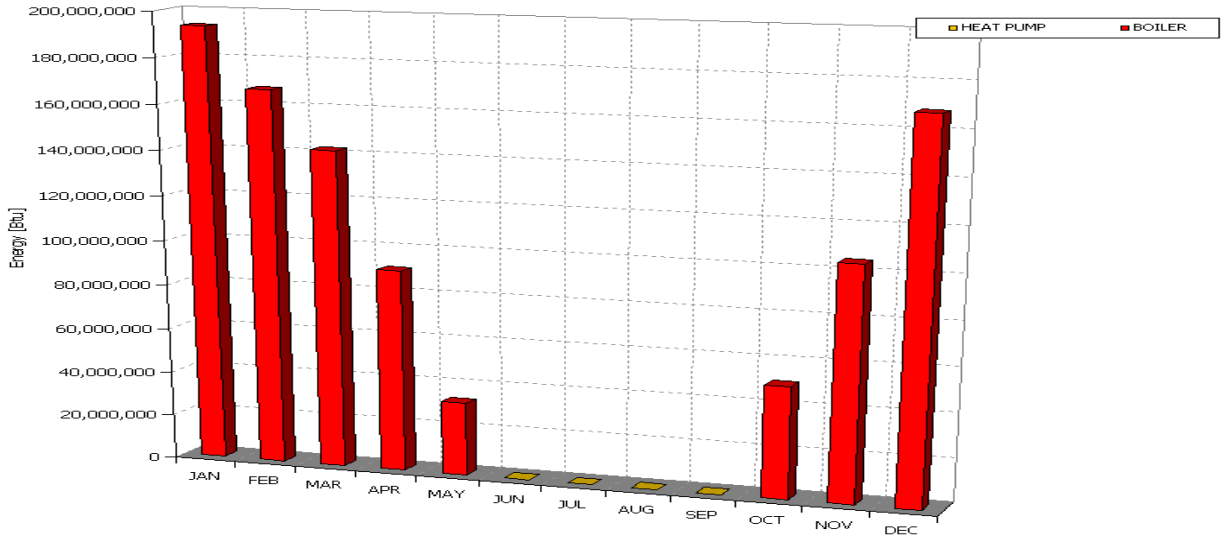
93% Boiler only application

Seasonal System Efficiency: 93%

Outdoor reset curve



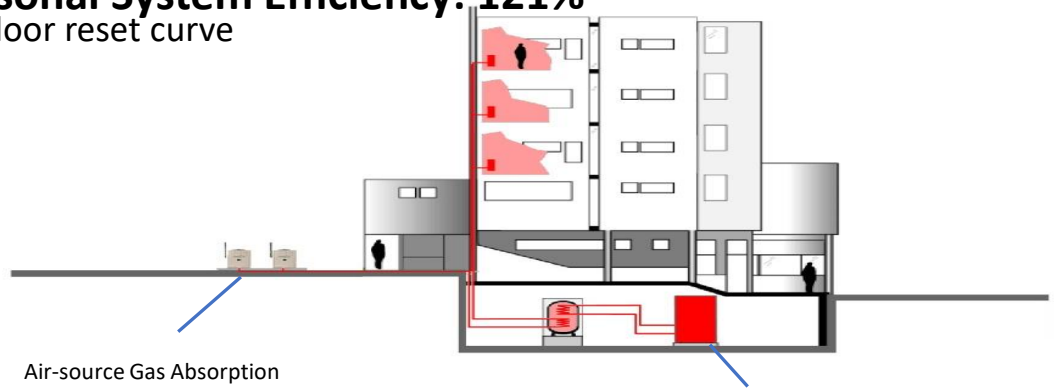
Existing Boiler Efficiency: 93%
Existing Boiler capacity: 400,000 Btu/h



Retrofit application – 93% Boiler + Heat Pumps

Seasonal System Efficiency: 121%

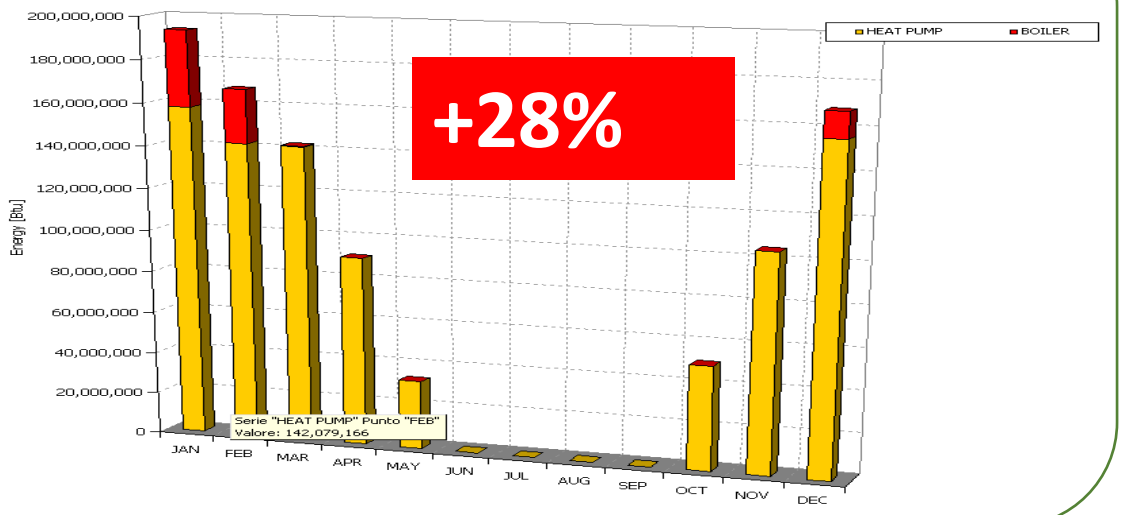
Outdoor reset curve



Air-source Gas Absorption
Heat Pump GAHP-A
Heating capacity: 247,000 Btu/h

Existing Boiler Efficiency: 93%
Existing Boiler capacity: 400,000 Btu/h

Heating energy produced by Heat Pumps: 92%

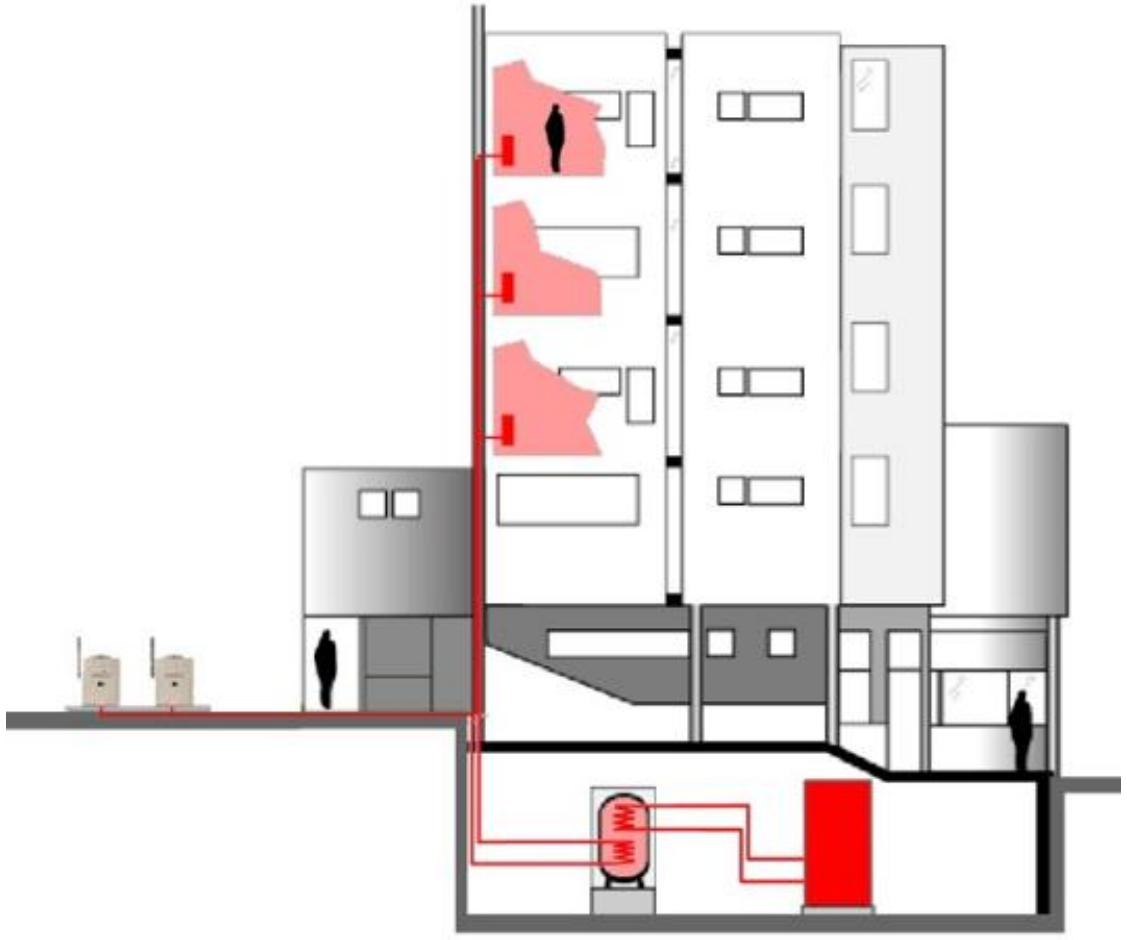


Ideal for integration into boiler systems to boost seasonal plant efficiency above 100%

Heat Pump & Condensing boiler working in conjunction to meet full load

Optimize peak & off peak

COP – HEATING MODE CAPACITY (BTU/h)				
EXTERNAL AMBIENT TEMPERATURE °F	OUTLET HOT WATER TEMPERATURE °F			
	86°F	113°F	122°F	140°F
	ΔΔT=18°F	ΔΔT=18°F	ΔΔT=18°F	ΔΔT=27°F
-20°F	1.02 COP 97,600 BTU/h	.93 COP 88,700 BTU/h	.89 COP 85,000 BTU/h	.88 COP 83,600 BTU/h
-13°F	1.03 COP 98,600 BTU/h	.94 COP 89,700 BTU/h	.90 COP 86,000 BTU/h	.89 COP 84,600 BTU/h
-4°F	1.04 COP 99,600 BTU/h	.95 COP 90,800 BTU/h	.91 COP 87,000 BTU/h	.90 COP 85,600 BTU/h
5°F	1.07 COP 102,000 BTU/h	.98 COP 93,500 BTU/h	.94 COP 90,100 BTU/h	.93 COP 88,400 BTU/h
14 °F	1.21 COP 111,600 BTU/h	1.07 COP 102,400 BTU/h	1.00 COP 95,900 BTU/h	.97 COP 92,800 BTU/h
19.4°F	1.23 COP 117,000 BTU/h	1.13 COP 108,200 BTU/h	1.05 COP 100,000 BTU/h	1.01 COP 96,200 BTU/h
35.6°F	1.33 COP 126,900 BTU/h	1.28 COP 122,200 BTU/h	1.19 COP 114,000 BTU/h	1.11 COP 105,800 BTU/h
44.6°F	1.39 COP 132,400 BTU/h	1.37 COP 130,700 BTU/h	**1.29 COP** **123,500 BTU/h**	1.21 COP 115,300 BTU/h
50°F	1.41 COP 134,800 BTU/h	1.41 COP 134,400 BTU/h	1.34 COP 128,000 BTU/h	1.26 COP 120,100 BTU/h
59°F	1.43 COP 136,500 BTU/h	1.43 COP 136,500 BTU/h	1.38 COP 132,000 BTU/h	1.29 COP 123,500 BTU/h
66°F	1.45 COP 138,200 BTU/h	1.45 COP 138,200 BTU/h	1.40 COP 133,800 BTU/h	1.33 COP 127,300 BTU/h
77°F	1.46 COP 139,200 BTU/h	1.46 COP 139,200 BTU/h	1.41 COP 134,800 BTU/h	1.34 COP 128,000 BTU/h



ROBUR
caring for the environment

ROBUR
caring for the environment

Integrated Plant Efficiencies

- Comfort Heating Application
- Building Load: 400,000 BTU/h
- 2 GAHP A units + 96% Boiler- 250,000 BTU

	PLANT EFFICIENCY	DESIGN TEMP	HP @ DESIGN T-%	ENERGY DELIVERED BY HP-%
Boston	1.21	7	46	93
Chicago	1.17	-5	43	93
Cleveland	1.21	2	27	95
Denver	1.17	-4	44	94
Detroit	1.16	3	45	90
Indianapolis	1.21	-2	44	95
Minneapolis	1.10	-15	43	88
New York City	1.23	13	48	93
Philadelphia	1.22	11	47	93
Portland	1.24	21	51	94
Seattle	1.24	23	52	94
St. Louis	1.23	2	45	96
Toronto	1.11	4	45	93
Vancouver	1.24	19	50	93

FORTIS BC™

Active Robur Gas Heat Pump Pilot Program

7 Installation Sites Throughout Vancouver

Low- & High-Rise Multi-Family, Secondary Schools

Preliminary results exceeding 100% Efficiency

Sustainable Technologies
EVALUATION PROGRAM

Gas Absorption Heat Pumps: Carbon, Energy and Cost Reductions for Heating Applications in a Cold Climate

neea

March 11, 2020

REPORT #E20-309

Robur Heat Pump Field Trial

TAF The Atmospheric Fund

Gas Absorption Heat Pumps

TECHNOLOGY ASSESSMENT AND FIELD TEST FINDINGS

Drastic Reduction in Electrical Power Consumption

Advantages of Robur System

- Reduces buildings' HVAC systems' electrical demand by 80% compared to electric cooling & heat pumps
- Single Phase Power reducing electrical infrastructure and associated costs
- No additional building upgrades required
- Eliminate or reduce electric demand charges
- Smaller generator requirements for applications requiring off grid power or emergency cooling

ROBUR
caring for the environment

Modularity / Redundancy

- Wide range of Systems available
- Redundancy with modular design
- Multiple Links available
- Application Flexibility
- Only use units required to meet building loads
- Staging capability adapts to changing load conditions

ROBUR
caring for the environment

Reliability / Durability

- Long Life
- No compressors or engines
- No mechanical wear and tear
- Less moving parts
- No refrigerant leaking
- Low maintenance required
- Completely sealed refrigerant circuit
  - no need to periodically recharge refrigerant

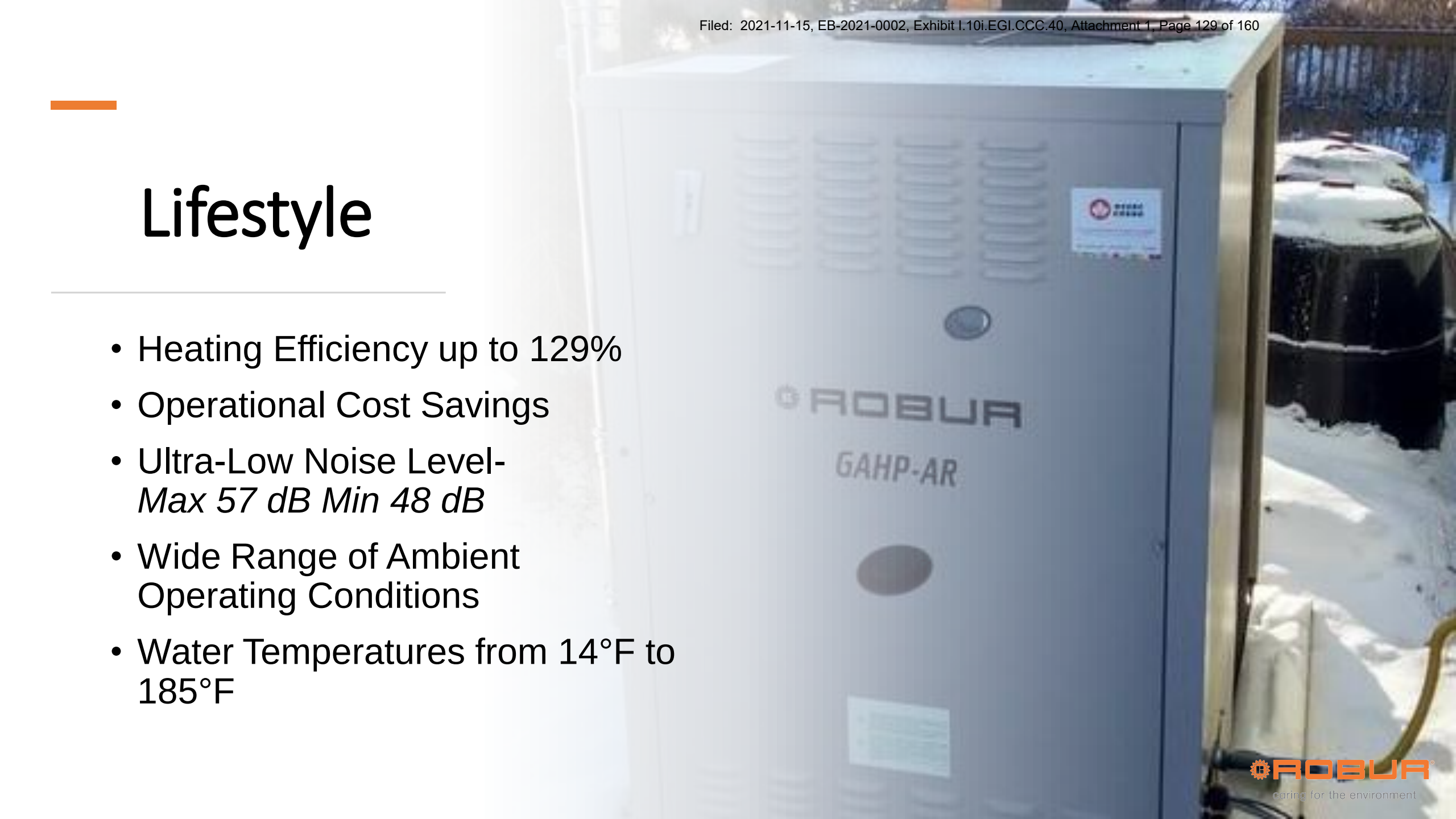
ROBUR
caring for the environment

Aesthetics

- Outdoor installation – No need for indoor equipment room
- Design freedom
- All-in-one, space saving unit
- Remote location possible
- Zoning – Eliminate ductwork
- Air cooled- No cooling tower

Lifestyle

- Heating Efficiency up to 129%
- Operational Cost Savings
- Ultra-Low Noise Level-
  Max 57 dB Min 48 dB
- Wide Range of Ambient Operating Conditions
- Water Temperatures from 14°F to 185°F



ROBUR
caring for the environment

Emerging Technology - K18

Actively Being Developed for the North American Market
Introduction Timeline & Price Point - TBD

- *Modulating, condensing gas absorption heat pump, using renewable energy and natural gas for heating and Indirect domestic hot water production.*
- *All-In-One Heating Solution*
- *18kW – 61,400 BTU's*
- *Up to 150% Efficient*
- *Easy to Install*
- *Low Maintenance*
- *Ultra Quiet Operation*
- *Natural Refrigerant*
- *Custom Residential Applications*

ROBUR
caring for the environment

30
1991 - 2021

$500 Rebate

Eligible Models

GAHP AR - GAHP A - GAHP W - GAHP W-LB - ACF 60 ST
ACF60 TK - ACF60 HT - ACF60 LB - ACF 60 HR

Thank you for your attention

Robur Corporation
827 E. Franklin St.
Evansville, IN 47711
812-424-1800
sales@robur.com
www.roburcorp.com

ROBUR®

caring for the environment

Follow Robur:

YANMAR ENERGY SYSTEMS

Natural gas engine driven heat pump

YANMAR Energy Systems Canada
Kazuko Newton, President
Kazuko_newton@Yanmar.com

YANMAR

Topic

1. YANMAR introduction
2. Gas Heat Pump (Natural Gas Driven –VRF) overview
3. VRF
4. Hydro Box
5. Roof Top Unit integration
6. Summary

Same Outdoor unit but 3 different configurations

YANMAR Group

Trade name	Yanmar Co., Ltd.
Head office	Osaka, Japan
Founded	March, 1912
Turnover	USD $5.9 Billion
Ordinary profit	USD $199 Million
Group Employees	16,678 (Worldwide)
Founder	Magokichi Yamaoka
President	Takehito Yamaoka

YANMAR North America

Industrial Engines

Commercial Marine Engines

Energy Systems

Parts

Agriculture Equipment

Construction Equipment

UTVs

REMAN

USA

YANMAR America
Adairsville, GA, USA

Canada

YANMAR Energy Systems Canada
Stoney Creek, ON, Canada
Established Oct. 2020!

YANMAR

R&D center and other facilities (JPN)

R&D Center

YANMAR Museum

Global training centre

Production (JPN)

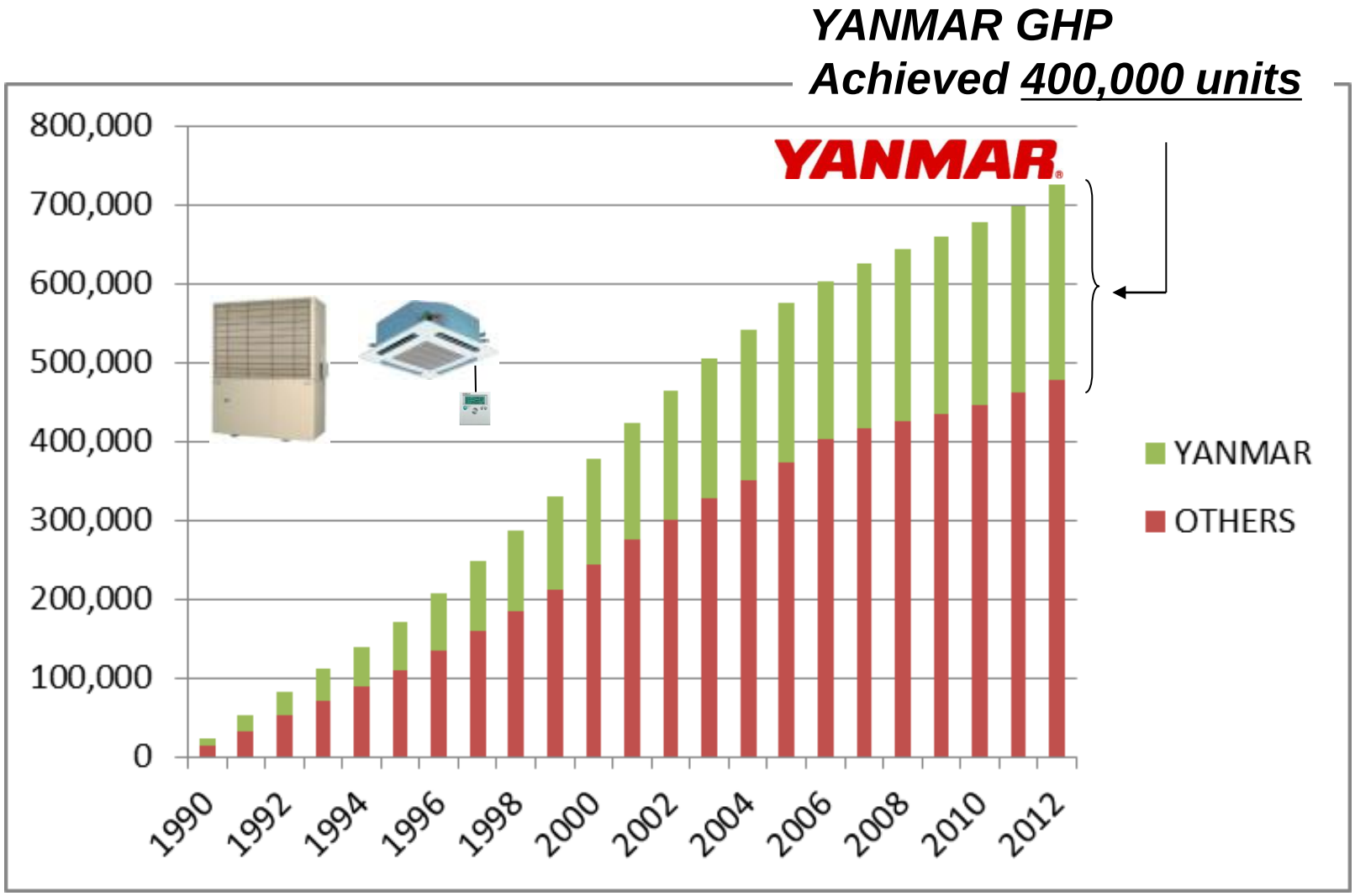
YANMAR Energy System Manufacturing Co., Ltd, Okayama, JPN

Product
CHP (Cogeneration)
GHP (Gas Heat Pump)

YANMAR America and Training centre (EVO//CENTRE)

YANMAR America, Adairsville, GA, USA
YANMAR Training Centre (EVO//CENTRE), Acworth, GA, USA

25+ years experience and more than 400,000 installation



Topic

1. YANMAR introduction
2. Gas Heat Pump (Natural Gas Driven –VRF) overview
3. VRF
4. Hydro Box
5. Roof Top Unit integration
6. Summary

What is GHP

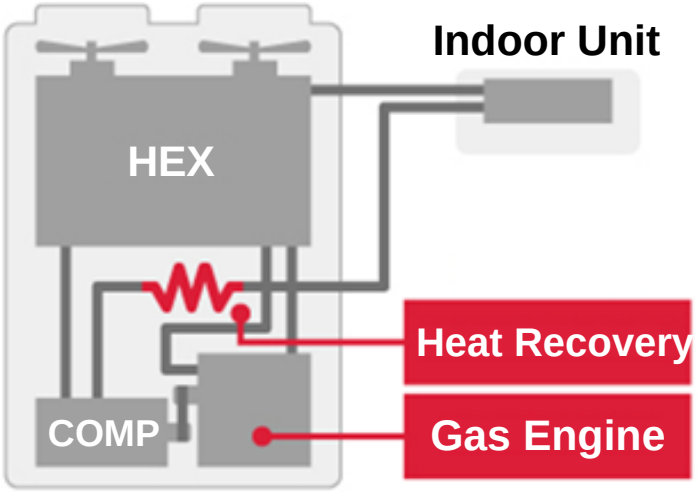
Gas **H**eat **P**ump (Gas engine driven Heat Pump)

YANMAR GHP

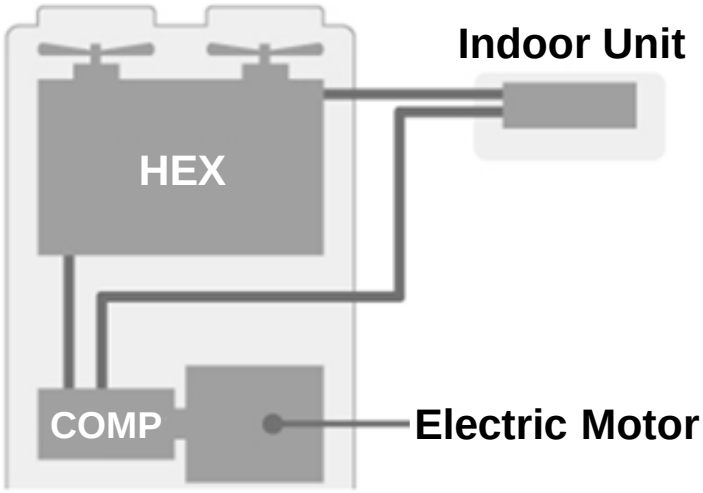
- Driven by a small gas engine
- Multi-split system
- Can connect multiple units

Traditional Electric (EHP)

- Driven by an electric motor
- Can connect multiple units



GHP

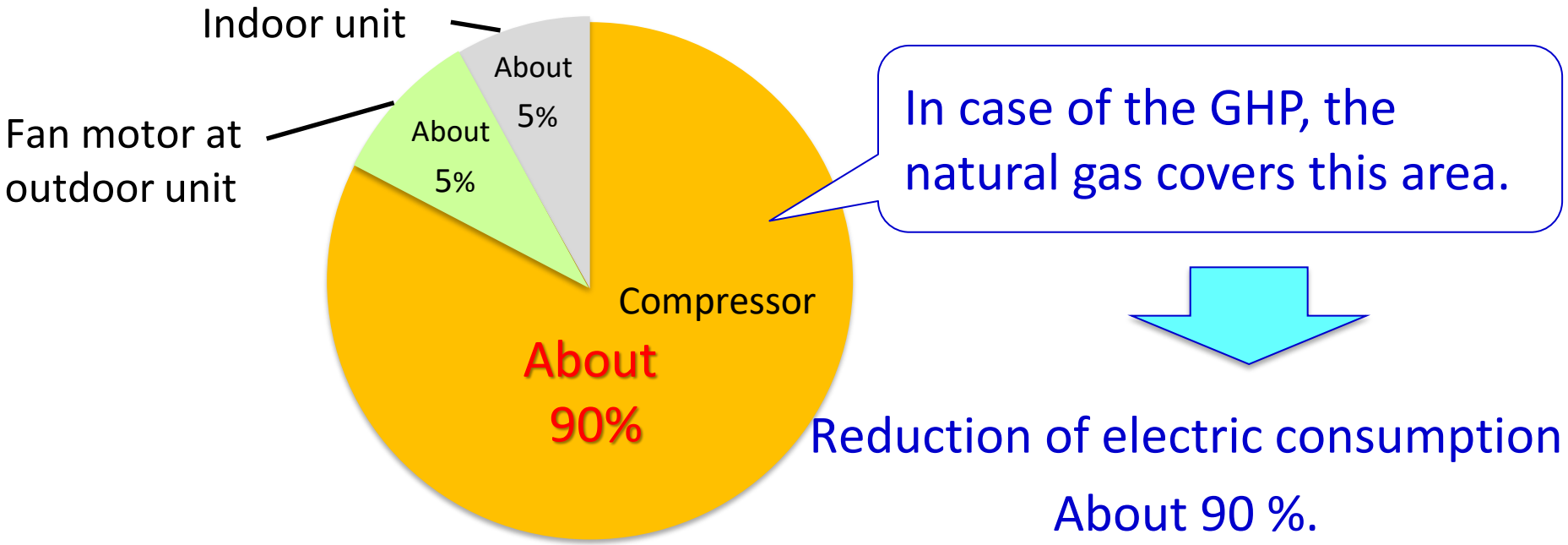


EHP

Reduce up to 90% of electricity use

- The GHP system can reduce the electric consumption about 90%

  - The ratio of energy consumption at heat pump system

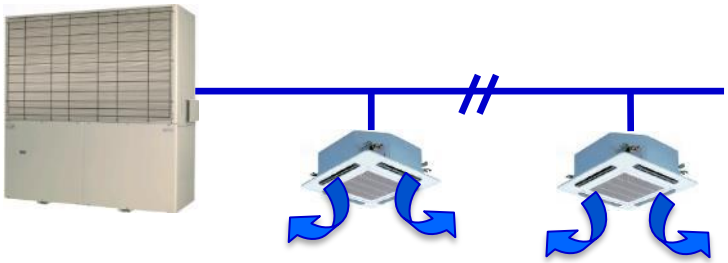


2 pipe and 3 pipe (heat recovery system)

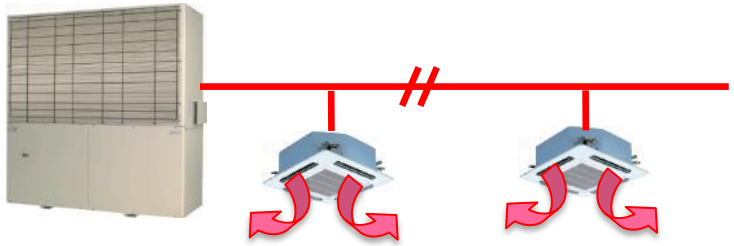
- The GHP has reverse cycle. Cooling or Heating are available with one GHP system.

➢ 2 pipe system (Standard)

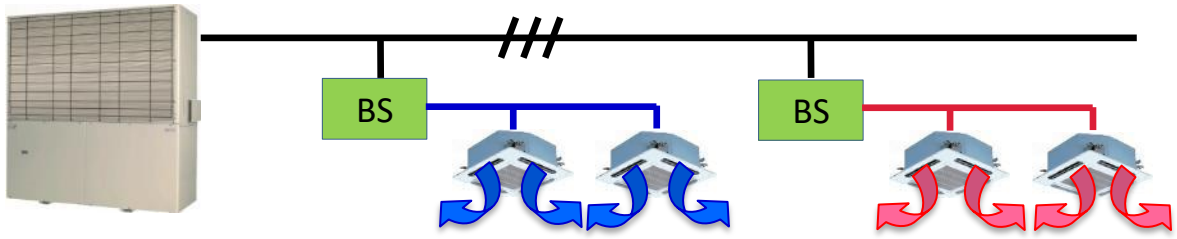
Cooling mode (Summer)



Heating mode (Winter)



➢ 3 pipe system (Heat Recovery)



3 Different ways to provide heating and cooling

Indoor Units

= **VRF**

Outdoor Unit

Hydro Box

= **Hydronic Base**

Roof Top Unit

= **RTU Integration**

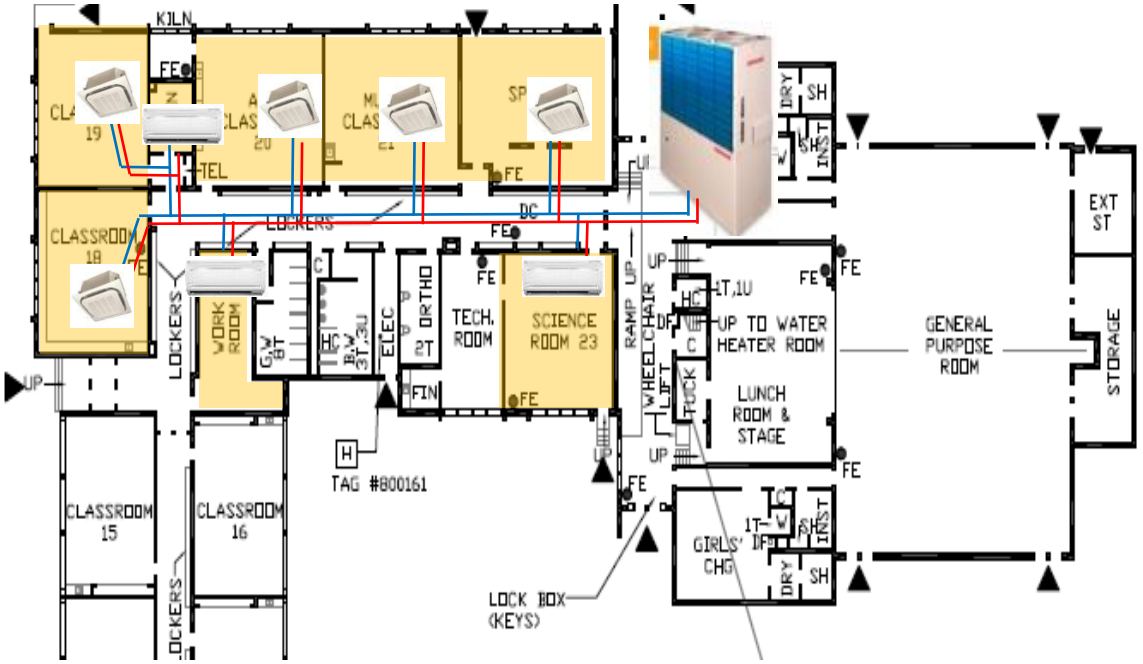
VRF System

- Most efficient
- Easy engineering

Application

- School
- Office
- Tenant building

VRF – Public School installation , Cambridge Ontario

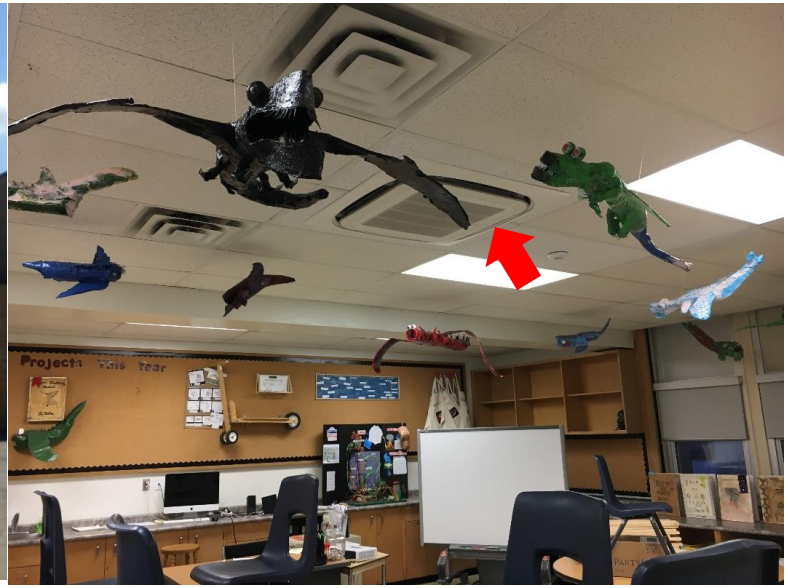


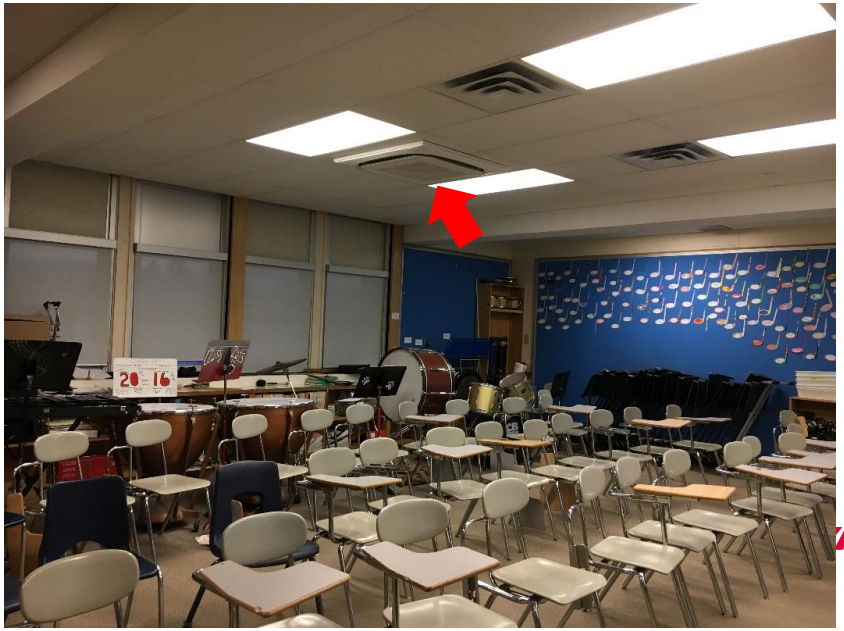
- Cambridge, Ontario, Canada
- Number of indoor unit 8
- Commissioned August 2016
- Current run hour 11791 hour (June 14th, 2021)

Maintenance history

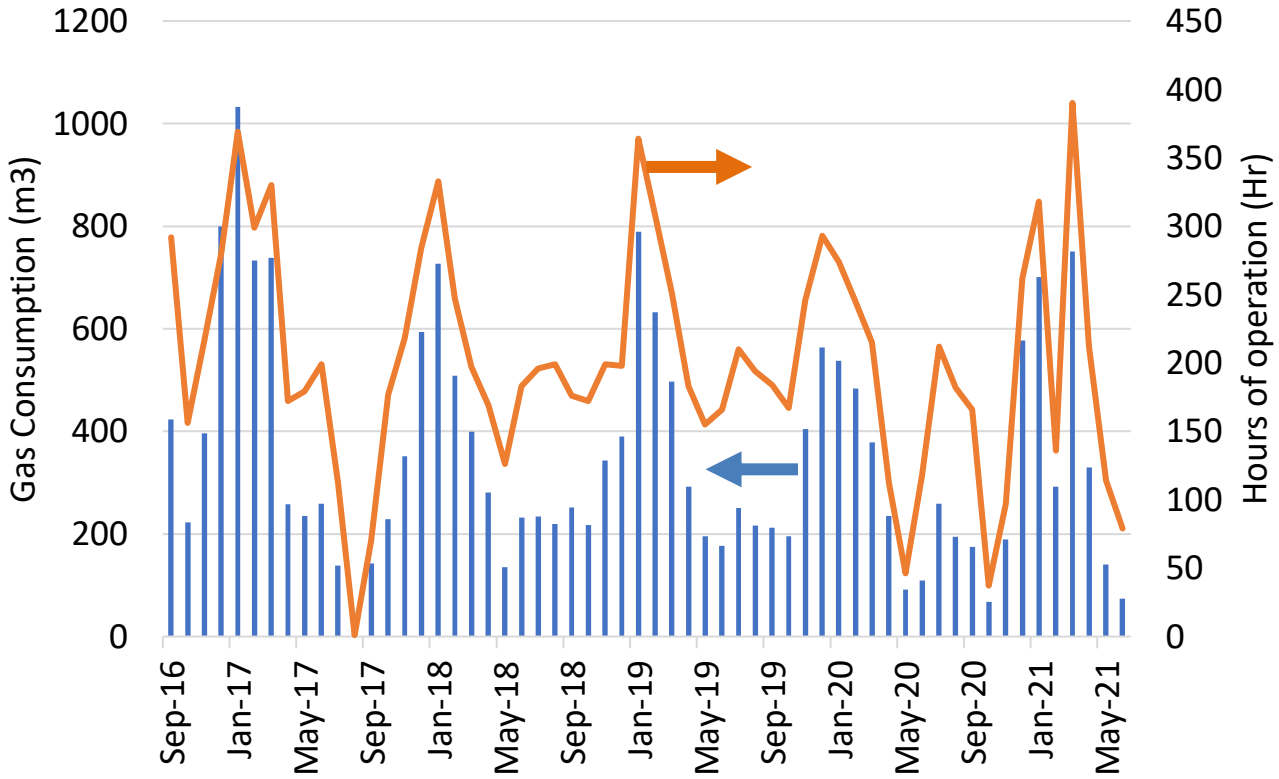
July 2020, 1st oil change 10,000 hour Service

VRF - Picture





Gas Consumption and operation hour for past 5 years

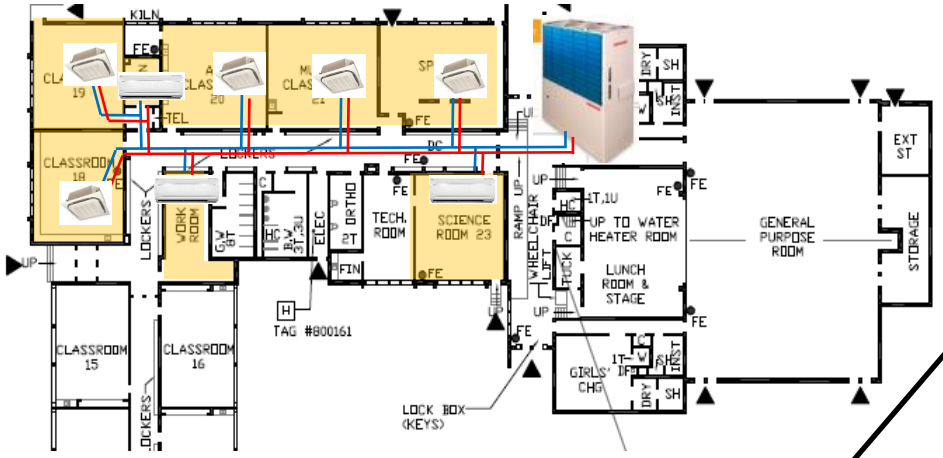


16 Rt Cooling Capacity / 220,000 BTU Heating Capacity

- Average Gas Consumption 0.49 m3/hour
- Average Gas Consumption 11.9 m3/day (3.3 CAD/Day @28cent/m3 gas)

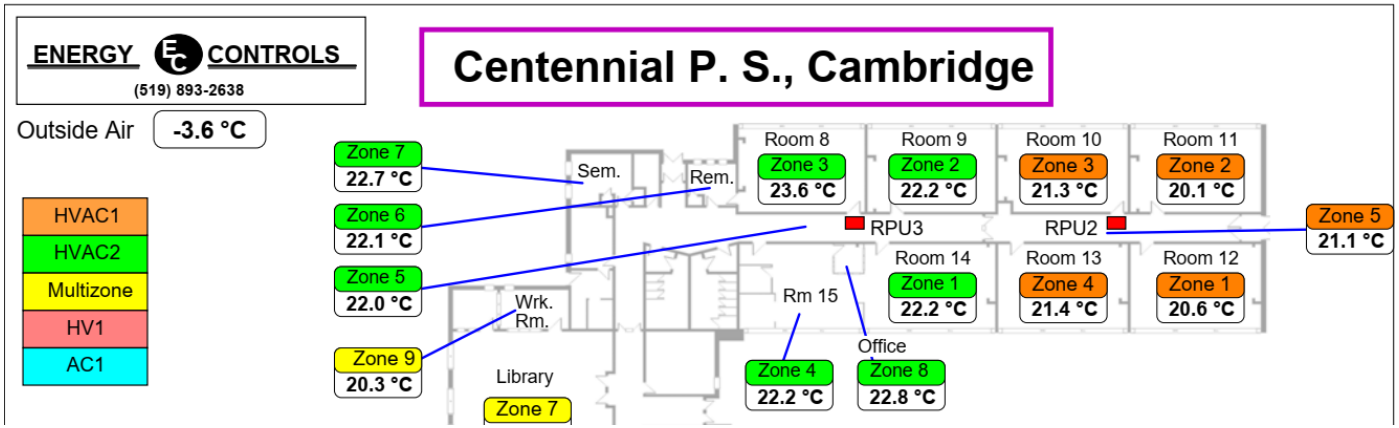
Energy Usage Comparison with 2 school

1. STEWART School, YANMAR Gas Heat Pump – 16 Rt

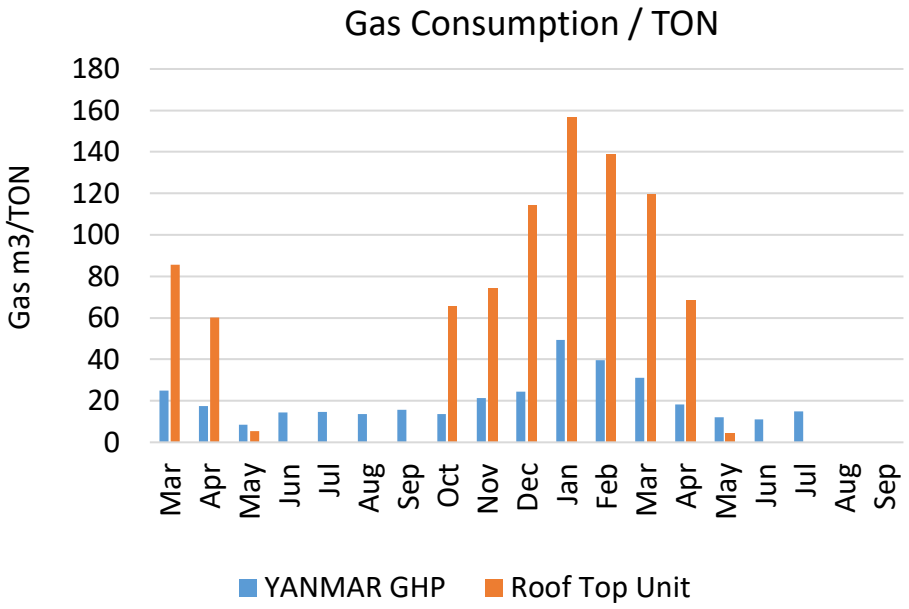


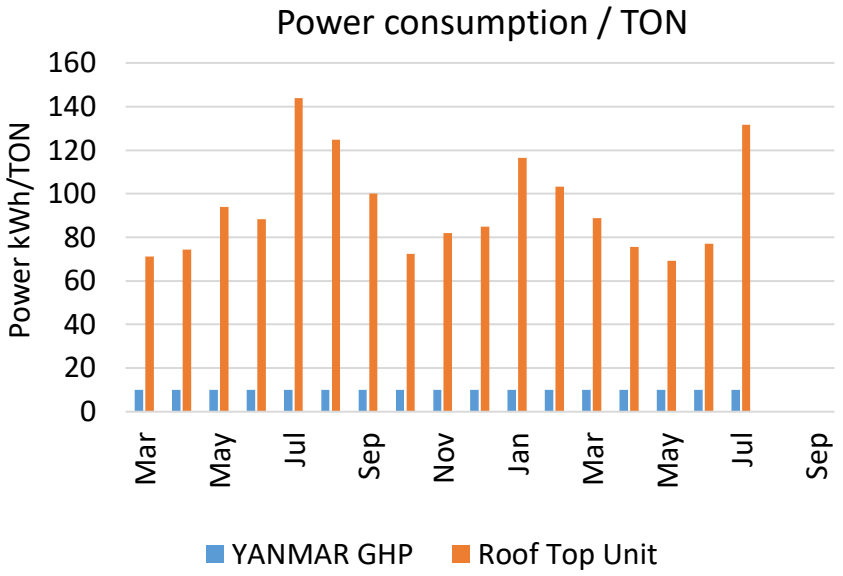
- Same School Board
- Same temperature setting and control
- Almost same building age
- Similar classroom set up

2. CENTENNIAL School, Roof Top Unit– TOTAL 25 Rt



Energy usage comparison

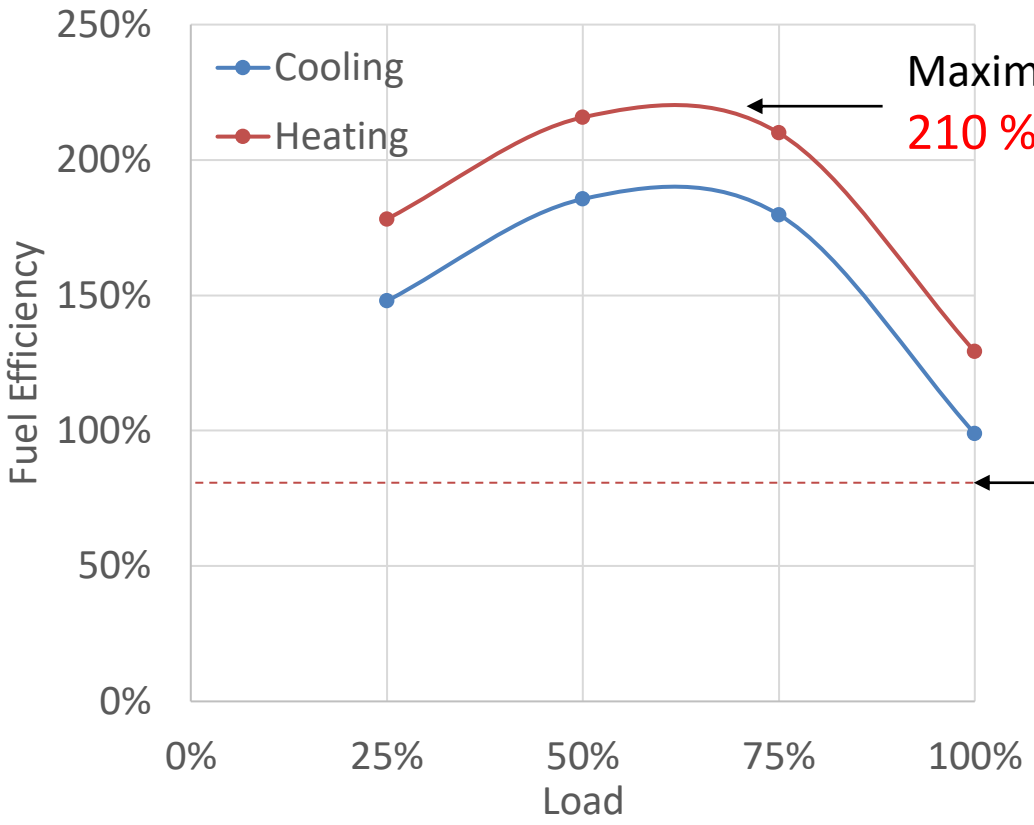




		YANMAR GHP	Roof Top
MONTHLY AVERAGE	HYDRO	10 kWh / TON	94 kWh /TON
	GAS	20.3 m3/ TON	52.0 m3/ TON
ANNUAL TOTAL	HYDRO	120 kWh / TON	1126 kWh/TON
	GAS	265 m3/ TON	743 m3 / TON

Even if GHP uses gas for cooling, total gas consumption is smaller than RTU

YANMAR GHP Part load efficiency



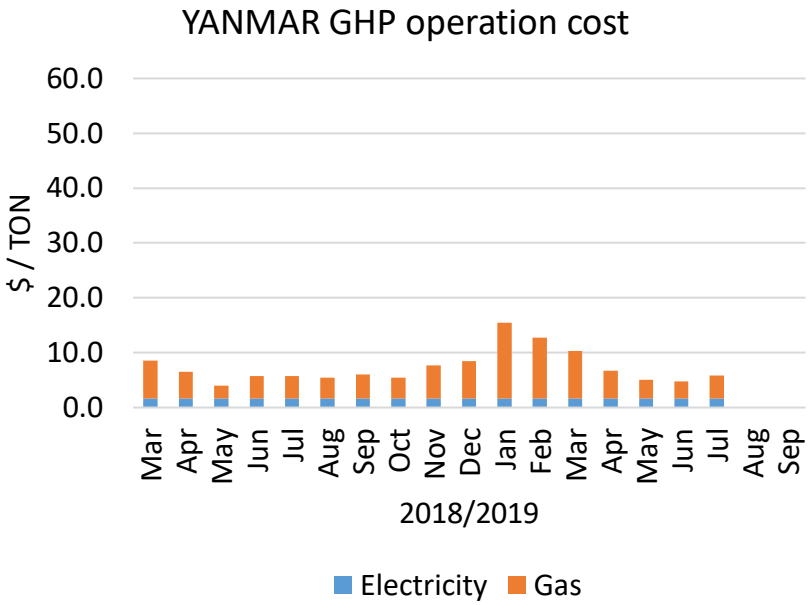
Maximum heating efficiency
210 %

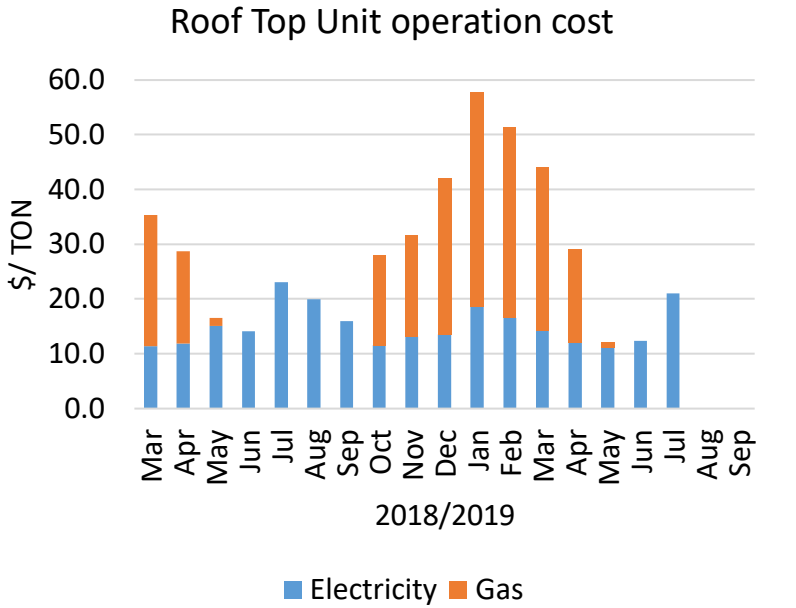
Boiler, Roof top unit
80%

Measured by
Intertek
Model NFZP168J

Highest heating efficiency = over 200%

$ per TON monthly operation cost for target area





		STEWART	CENTENNIAL
MONTHLY AVERAGE	HYDRO	$ 1.6 / TON	$ 15.0 /TON
	GAS	$ 5.7 / TON	$ 13.4 / TON
	TOTAL	$ 7.3 / TON	$ 28.5 / TON
ANNUAL TOTAL	HYDRO	$ 19 /TON	$ 180 /TON
	GAS	$ 74 / TON	$ 186 / TON
	TOTAL	$ 93 / TON	$366 / TON

4 times

Power 16c/kWh
Gas 28 cent/m3

YANMAR

3 Different ways to provide heating and cooling

Indoor Units

VRF

Outdoor Unit

Hydro Box

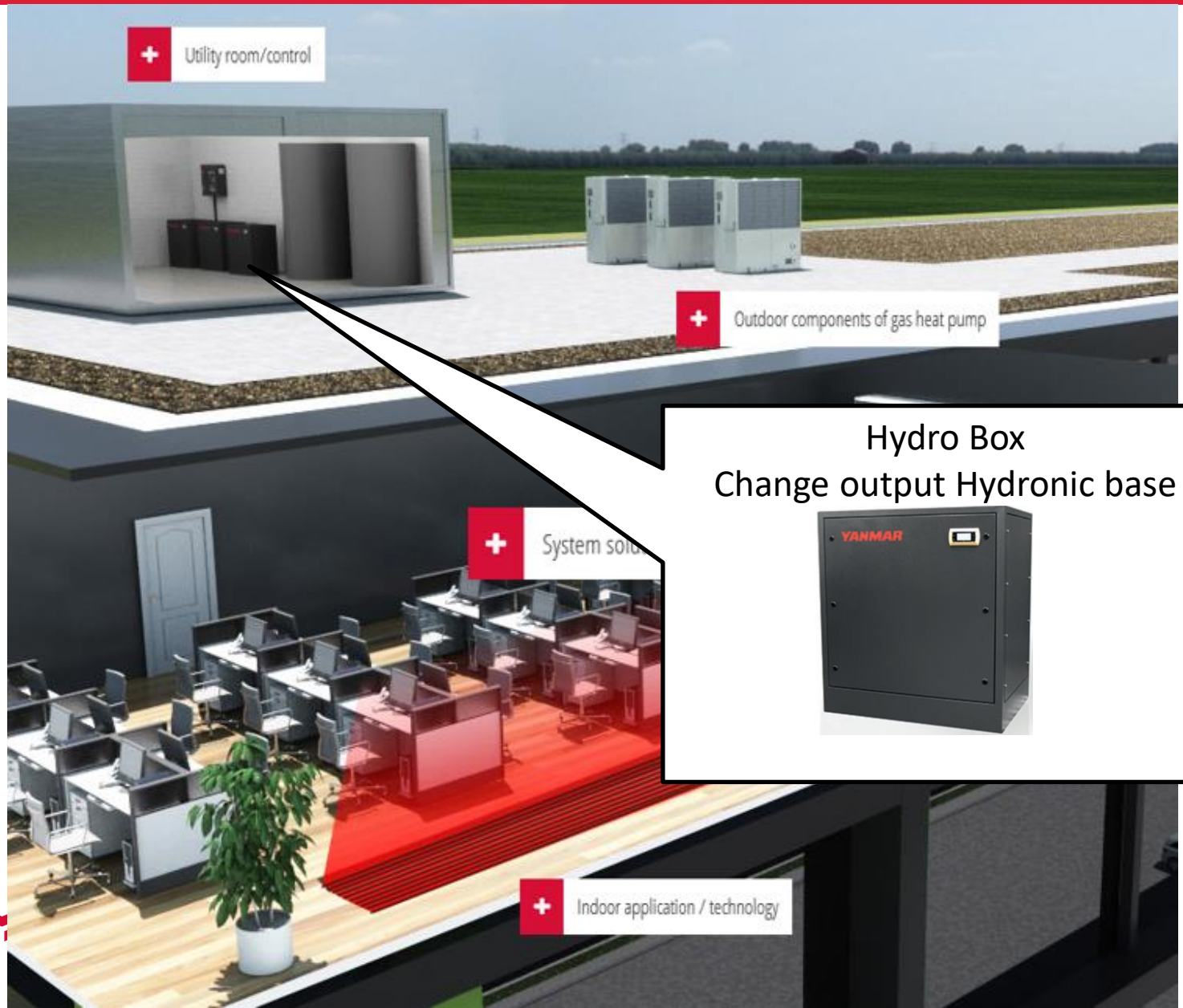
Hydronic Base

Roof Top Unit

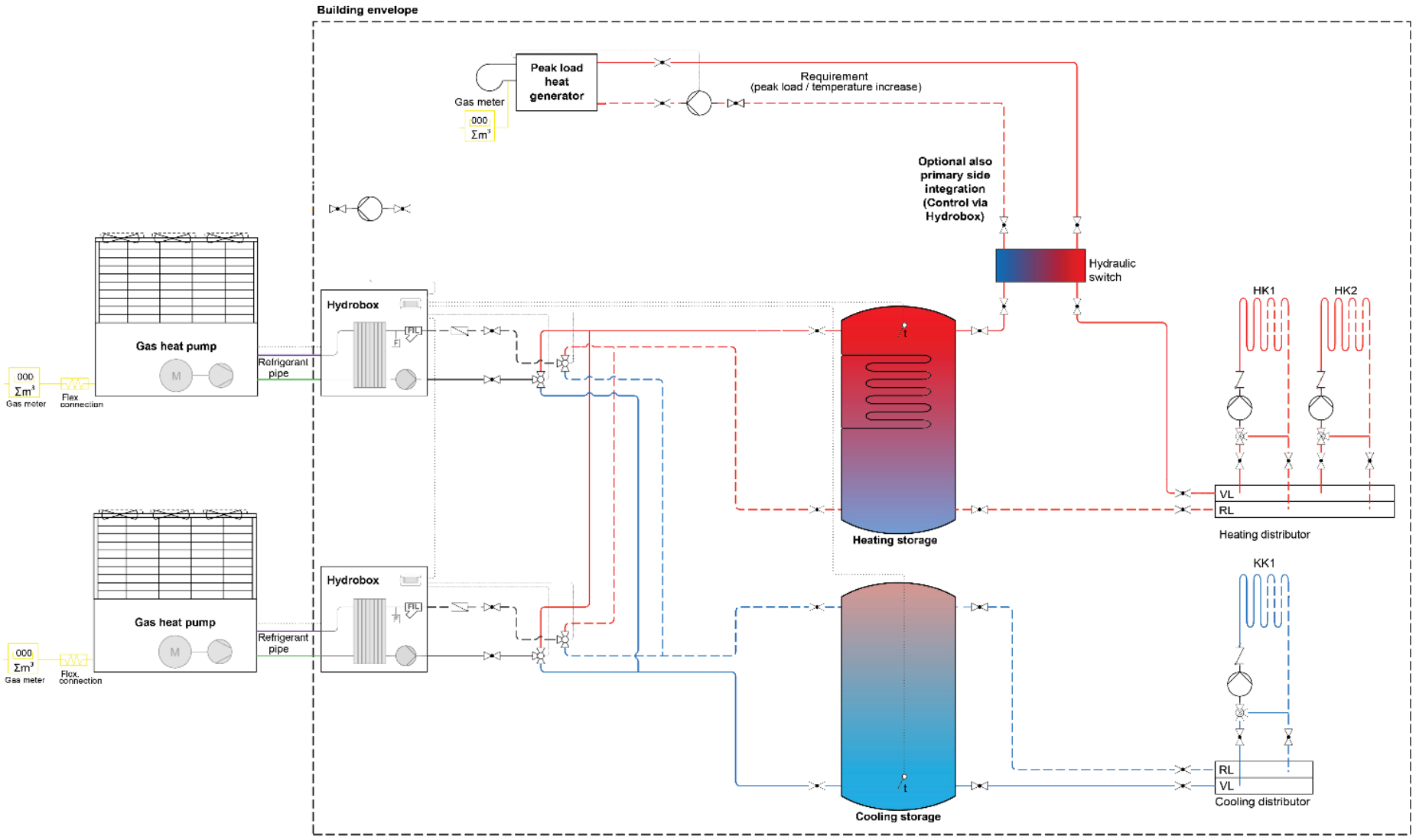
RTU Integration

YANMAR

Hydro Box – Air / Water System



This Hydro Box allows the integration of GHP with existing water System



3 Different ways to provide heating and cooling

Indoor Units

= **VRF**

Outdoor Unit

Hydro Box

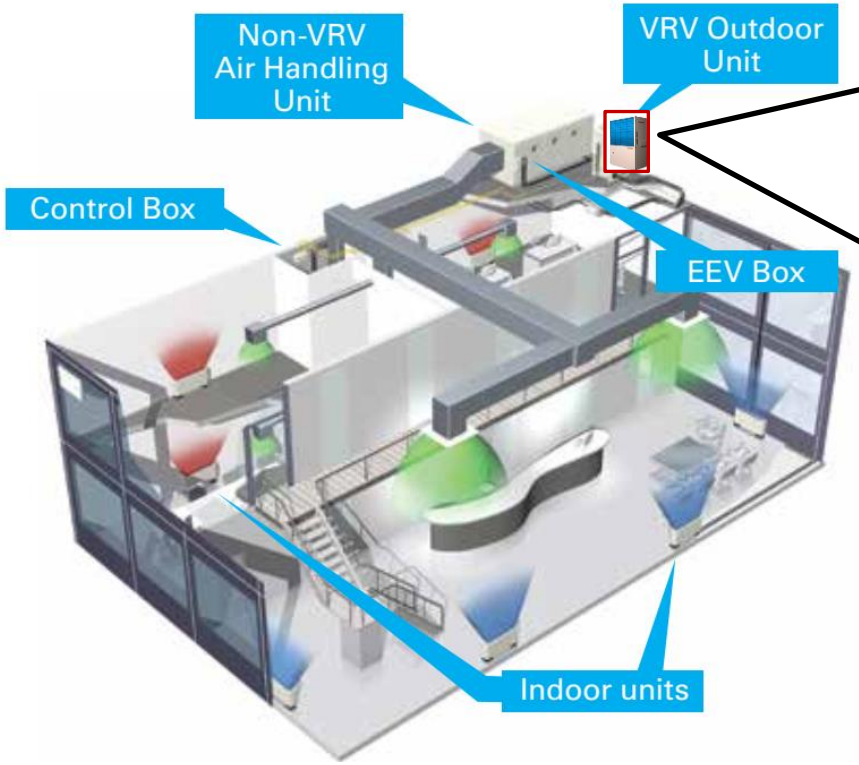
= **Hydronic Base**

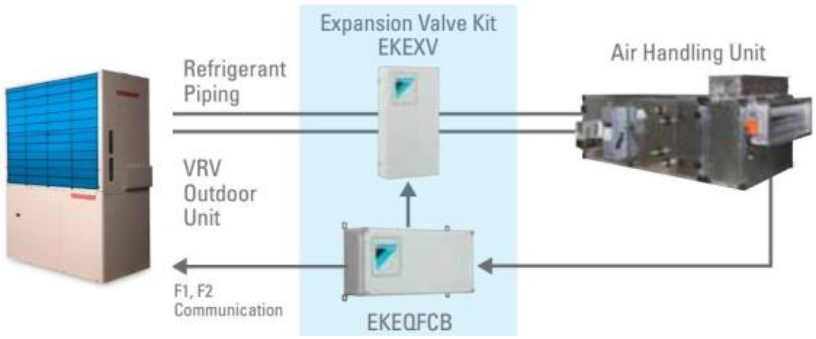
Roof Top Unit

= **RTU Integration**

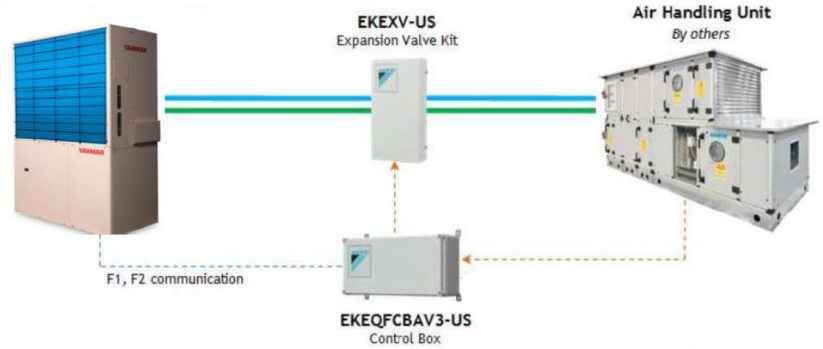
YANMAR

Use existing Roof Top Unit and Duct system. Improve efficiency by GHP





High School Gym, RTU integration Example



Summary

1. Commercially ready product
2. Based on existing customer's configuration, 3 different ways to output heating and cooling
3. Efficient and cost effective operation

Challenge

1. Establish energy modeling – working with NRC
2. Efficiency and measurement standard for GHP

Future

1. Mixed combustion with Hydrogen – Already tested up to 22% H_2

ENBRIDGE GAS INC.

Answer to Interrogatory from
Energy Probe Research Foundation (EP)

Interrogatory

Issue 10j

Reference:

Exhibit D Tab 1 Schedule 3 Page 11 Table 7 Low Carbon Transition Program Targets

Preamble:

5. The proposed targets for the Low Carbon Transition Program are outlined in Table 7 below. These targets have been informed by a number of inputs including, but not limited to:

- Consultation with HVAC manufacturers, distributors and contractors;
- Jurisdictional scans to determine how key program elements compared to similar jurisdictions;
- Prior and current experience with the demonstration and deployment of heat pumps through the Energy Leader offer, demonstration projects and pilot programs; and
- Consideration of the OEB's guidance with respect to the primary objective of DSM, "assisting customers in making their homes and businesses more efficient in order to help better manage their energy bills."

Question(s):

a) Confirm EGI has not had an LCTP in the past.

b) Do any other jurisdictions have a similar Program? Please provide references.

c) Has EGI Piloted the LCTP program to determine the level of supplier and customer interest? If so please provide the results.

d) What is the range of installed costs for a gas air source heat pump?

e) Please provide details of the LCTP incentives for supplier/installers and customers

Response:

a) Confirmed.

b) Enbridge Gas is aware of various incentive programs for electric air source heat pumps across North America[1], but is not aware on any that specifically focus on residential hybrid heating as it is conceived in this plan. Residential gas heat pumps are not yet commercialized in North America; therefore, incentive programs are not yet in place elsewhere. Enbridge Gas is aware of utilities in other jurisdictions that are currently researching and developing commercial/residential natural gas heat pump incentive programs, including FortisBC.

c) Enbridge Gas is currently piloting a residential hybrid heating incentive program in London[2]. Supplier (manufacturers and contractors) interest is strong, with 5 participating manufacturers (Lennox, Carrier, Napoleon, Daikin,and Goodman), each with their partnering contractors. Testing customer interest is one of the learning objectives of the pilot and Enbridge Gas is not yet in a position to report on results because the pilot is still in field. More details regarding the steps taken designing and fielding this pilot can be found in Exhibit I.7.EGI.STAFF.17e.

   Enbridge Gas has incented commercial gas heat pumps through its Energy Leaders offering since 2020 to provide increased financial support for early adopters. The offering generated interest from property managers and four units are either installed or underway. Manufacturers of gas heat pumps with a distribution network in Ontario are very interested to work with Enbridge Gas to promote gas heat pumps as are other manufacturers who are planning on bringing products to the Ontario market in the near future.

d) Based on pilot projects to date, the equipment pricing for commercial gas heat pumps are as follows:

   - Absorption-type: $12,000 - $25,000 for a gas heat pump ranging in size from 35 KW - 85 kW
   - Engine-driven: $27,000 for a 50 kW gas heat pump

   Installation costs varies depending on the application but can range between 2 to 3 times more than the GHP equipment costs.

e) Please see response to Exhibit I.10h.EGI.STAFF.77f.

---

[1] See, for example, the CleanBC Better Homes and Home Renovations Rebate Program (https://betterhomesbc.ca/rebates/central-system-air-source-heat-pump-rebate/)
[2] Pilot program encouraging switch to hybrid heating, https://london.ctvnews.ca/pilot-program-encouraging-switch-to-hybrid-heating-1.5588436

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Sustainable Energy Association (OSEA)

Interrogatory

Issue 10j

Reference:

Exhibit D-1-4, Table 1

Preamble:

Enbridge's Low Carbon Transition program is influenced by NRCan's Paving the Road to 2030 and Beyond reports. OSEA is interested in understanding what NRCan recommendations were included in or excluded from Enbridge's DSM program proposal.

Question(s):

a) Please provide a link for or copy of the report referenced in the footnote on Page 1 of 9 of Exhibit E-3-1 (Paving the Road to 2030 and Beyond: Market transformation road map for energy efficient equipment in the building sector, Energy and Mines Ministers' Conference, NRCan (August 2018)).

b) Enbridge leverages three key barriers identified by NRCan (i.e., accessibility, awareness, and affordability) to assist in bringing new low carbon technologies to market. Did NRCan identify any other key barriers in its report? If so, please provide Enbridge's rationale for not addressing these barriers in the DSM application.

c) There is a missing footnote number "6" on Page g 2 of 9 of E-3-1 relating to paragraph 3. Please provide the missing reference in the NRCan Road Map. If no NRCan reference is available, please provide a different reference for the claim made in paragraph 3.

Response

a) https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/2018/en/18-00072-nrcan-road-map-eng.pdf

b) NRCan identified 2 other barriers related to space heating technologies: Availability and Acceptance.

Availability

Other than residential gas heat pumps, the other technologies offered in the low carbon program are currently commercially available so there was no specific requirement to address the availability barrier for hybrid heating and commercial gas heat pumps. Similarly, residential gas heat pumps are expected to enter the Canadian market in 2024. Three manufacturers have indicated they will have certified products in Canada so there was no need to specifically address this barrier as part of the low carbon program.

Acceptance

Acceptance is defined as 3 parts in the in the NRCan roadmap[1]:

1. Focus groups, surveys and other market research on contractor and consumer awareness and attitudes towards the technologies.
2. Number of warranty claims and/or call backs from contractors.
3. Number of complaints through online product reviews and social media.

Enbridge Gas believes the first point regarding awareness and general attitude towards the technology will be monitored as part of the end use surveys but the other 2 points are not something that would be reasonable to use resources to track in a program so it was excluded altogether.

c) The missing footnote at Exhibit E, Tab 3, Schedule 1, page 2 of 9 in evidence should have been footnoted as follows:

[6] Paving the Road to 2030 and Beyond: Market transformation road map for energy efficient equipment in the building sector, Energy and Mines Ministers' Conference, NRCan (August 2018), p. 32, Figure 4-2.

The referenced report can be accessed at the link provided in response to part a above.

[1] Paving the Road to 2030 and Beyond: Market transformation road map for energy efficient equipment in the building sector, Energy and Mines Ministers' Conference, NRCan (August 2018), p. 79. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/2018/en/18-00072-nrcan-road-map-eng.pdf

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1]

Question(s):

Please confirm that the Low Carbon Transition Program would, if approved, provide Enbridge with a budget to support natural gas heat pumps in a competitive market against electric air source and electric ground source heat pumps. Please justify the insertion of Enbridge, using ratepayer funds, into that competitive market. Please explain how Enbridge proposes to ensure that its incentives and involvement will not skew the market and result in customers making less efficient choices of heating equipment than they would otherwise make.

Response:

Enbridge Gas, as stated in evidence, justifies the need for its Low Carbon Program to support the goals and initiatives of NRCan's market transformation road map for energy efficiency equipment. The road map clearly calls out gas heat pumps as a key technology that needs program support to address the market barriers to adoption.

DSM programs are a form of market intervention; Enbridge's involvement and incentives accelerate the uptake of more efficient measures in the market to the detriment of lesser efficient options. The gas heat pump measures supported through the low carbon transition program are intended to influence customers to make more efficient choices of heating equipment in comparison to the most common and reasonable baseline scenarios (i.e., conventional gas-fired equipment).

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1, p. 1]

Question(s):

Please confirm that the reference in para. 2 to “heat pump technologies” refers to natural gas heat pumps.

Response

“Heat pump technologies” refers to electric air source heat pumps as part of a hybrid heating solution, residential natural gas heat pumps and commercial natural gas heat pumps.

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1, p. 2]

Question(s):

Please explain how “Engaging industry, municipalities, and other influential stakeholders that could support efficiency policy progression and equipment standard advancement” is different from lobbying.

Response:

Enbridge Gas has regular discussions with all levels of government to ensure alignment of policy and implementation of DSM activities. The vast majority of the interactions are not with elected officials, but with unelected civil servants. This includes advocating for a more rapid adoption of the next-generation technologies supported in the Low Carbon Transition Program and the need for improved codes and standards to support market adoption.

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1, p. 3]

Question(s):

Please provide a more precise estimate of hybrid heating system efficiencies, with references. Please calculate the efficiency impact of a hybrid heating system at that efficiency compared to a high efficiency furnace, and show that it is a cost effective efficiency option.

Response:

Please see response to Exhibit I.10h.EGI.STAFF.77b for a lifecyle cost comparison of a hybrid heating system and a high efficiency furnace. Based on the modelled scenarios in Table 1 and Table 2 in Exhibit I.10h.EGI.STAFF.77b, Enbridge Gas estimates the hybrid heating seasonal efficiency (i.e., co-efficient of performance) to be 1.34 and 1.22, respectively.

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1p. 3]

Question(s):

Please provide a more precise estimate of gas heat pump efficiencies, with references. Please calculate the efficiency impact of a gas heat pump at that efficiency compared to a high efficiency furnace, and show that it is a cost effective efficiency option.

Response:

Please see response to Exhibit I.10h.EGI.STAFF.77b.

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1p. 3]

Question(s):

Please provide a comparison of the efficiency and lifecycle cost of a hybrid heating system, a gas heat pump, an electric air source heat pump, and a ground source (or geothermal) heat pump, with references, and assuming the cost of carbon currently forecast by the federal government and a detached home in Ottawa.

Response:

Please see response to Exhibit I.10h.EGI.STAFF.77. Calculations are based on 2 archetype homes in Toronto built pre and post 1980. An archetype home for Ottawa, is, regrettably, not yet available in the calculator. A Toronto home, however, is more representative of typical weather conditions for the majority of Enbridge customers.

Enbridge Gas has not evaluated ground source heat pumps as a residential DSM measure because of its low market potential for retrofit applications.

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1p. 5]

Question(s):

Please explain why the incentive for this program is not based on lifetime cubic meters saved, like all other residential programs.

Response:

Please see response to Exhibit I.10h.EGI.STAFF.80.

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1p. 5]

Question(s):

Please confirm that the annual GHGs produced in Ottawa for a detached home with

a) A high efficiency furnace is about 5 tonnes
b) A natural gas heat pump is about 4 tonnes, and
c) A ground source heat pump is about 0.5 tonnes.

Response:

Please see Table 3 in Exhibit I.10h.EGI.STAFF.77b for estimated GHG emissions for a Toronto home for scenarios a) and b). Enbridge Gas is unable to confirm the annual GHGs produced in Ottawa because the NRCan modelling software does not have Ottawa weather profile available. Enbridge Gas cannot confirm the annual GHGs produced for a home with a ground source heat pump.

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Issue 10j

Reference:

[Ex. E/3/1p. 5]

Question(s):

Please explain how the fact that a program is new is a reason for the Board to order that it should not be subject to evaluation, verification or any other scrutiny.

Response:

Enbridge Gas has not asked the OEB to direct that new programs not be subject to evaluation, verification or any other scrutiny. Enbridge Gas is submitting that impact evaluation on nascent programs like the proposed Residential Heat Pump Program Offering may not be constructive and may be an ineffective use of ratepayer funding, due to the program's lack of time in market. Further, as described at Exhibit C, Tab 1, Schedule 1, page 29, impact evaluation is coordinated by the OEB, and as such, impact evaluation priorities for any given program year are discussed with the EAC.