Asha Patel
Technical Manager, Regulatory Applications
Regulatory Affairs

Tel: 416-495-5642
Email: Asha.Patel@enbridge.com
EGIRegulatoryProceedings@enbridge.com

Enbridge Gas Inc.
500 Consumers Road
North York, Ontario
M2J 1P8

VIA RESS and EMAIL

May 3, 2021

Ms. Christine Long
Registrar
Ontario Energy Board
2300 Yonge Street, 27th Floor
Toronto, Ontario
M4P 1E4

Dear Ms. Long:

Re: Enbridge Gas Inc. (Enbridge Gas)
Ontario Energy Board (OEB) File No.: EB-2021-0002
Multi-Year Demand Side Management Plan (2022 to 2027)

In accordance with the OEB's Letter dated December 1, 2020 in the EB-2019-0003 proceeding, which invited Enbridge Gas to develop and file a comprehensive DSM plan application, please find attached an application and supporting evidence from Enbridge Gas for its Multi-Year Demand Side Management Plan (2022 to 2027).

The above noted submission has been filed electronically through the OEB's RESS and will be made available on Enbridge Gas's website at:

https://www.enbridgegas.com/Regulatory-Proceedings

Should you have any questions on this matter please contact the undersigned at 416-495-5642.

Sincerely,

(Original Digitally Signed)

Asha Patel
Technical Manager, Regulatory Applications

cc: D. O'Leary, Aird & Berlis

EXHIBIT LIST

A – ADMINISTRATION

B – OVERVIEW

C – DSM FRAMEWORK

D – 2022-2027 DSM PLAN

E – DSM PROGRAM DETAILS

ONTARIO ENERGY BOARD

IN THE MATTER OF the Ontario Energy Board Act, 1998, S.O. 1998, c. 15, Schedule B, as amended;

AND IN THE MATTER OF an application by Enbridge Gas Inc. pursuant to Section 36(1) of the *Ontario Energy Board Act, 1998*, S.O. 1998, for an order or orders approving its Demand Side Management Plan for 2022-2027.

APPLICATION

1. Enbridge Gas Inc. ("Enbridge Gas" or the "Company"), was formed by the amalgamation of Enbridge Gas Distribution Inc. ("EGD") and Union Gas Limited ("Union"), on January 1, 2019 pursuant to the *Ontario Business Corporations* Act, R.S.O. 1990, c. B. 16. Enbridge Gas carries on the business of selling, distributing, transmitting, and storing natural gas in Ontario. The Company also undertakes Demand Side Management ("DSM") activities.

2. Prior to amalgamation EGD and Union were operating DSM programs under a regulatory framework governing DSM activities in Ontario's natural gas sector which was initially established in 1993 under EBO 169-III.

3. On May 21, 2019 the Ontario Energy Board ("OEB"), initiated the initial phase of the OEB's Framework Consultation process (EB-2019-0003) (the "DSM Consultation"). The purpose of the DSM Consultation was to establish a new DSM Framework that would replace the DSM Framework originally approved for the 2015-2020 time period in EB-2014-0134[1]. The 2015-2020 Framework was set to expire on December 31, 2020 but was extended by one year with the OEB approval of the Company's 2021 DSM Plan Application (EB-2019-0271).

[1] EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014).

4. On December 1, 2020, the OEB issued a letter (the "DSM Letter)"[2] to, *inter alia,* Enbridge Gas communicating that it had concluded the DSM Consultation in favour of an adjudicative process and invited Enbridge Gas to file a comprehensive multi-year DSM plan application for the post-2021 period.

5. Enbridge Gas seeks approval of this Application which has two distinct sections:
   - Section 1: Proposed DSM Framework effective 2022 ("Proposed Framework")
   - Section 2: Proposed 2022-2027 Multi Year DSM Plan ("DSM Plan")

6. Although there are two separate sections, the Proposed Framework and the proposed DSM Plan need to be reviewed and evaluated together as the Proposed Framework underpins the proposed DSM Plan.

7. The Proposed Framework is in large part an extension of the 2015-2020 Framework but has been adjusted to reflect feedback received from the DSM Consultation which began on May 21, 2019 and ended with the issuance of the DSM Letter on December 1, 2020. The Proposed Framework also incorporates changes Enbridge Gas believes are appropriate given its long standing experience delivering DSM programming and given the changes occurring in the current energy environment.

8. The proposed DSM Plan is for a six-year term which allows for long term planning and program continuity, stability for the utility to commit to energy conservation efforts, as well as certainty for customers and other market participants of sustained DSM support across Ontario. It also minimizes the administrative time and effort of additional regulatory review. Half-way through the six-year term, the Company proposes a mid-point assessment of those program offerings and metrics which are anticipated to likely require adjustments at that time for the reasons set out in this Application.

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

9. In order for Enbridge Gas to maintain DSM program continuity into January 2022 and the 2022 program year, the Company would need to receive final approval from the OEB for this Application by August 31, 2021. Given the Company's experience with similar applications in the past and in recognition of the hearing schedule that the OEB is likely to set in this proceeding, Enbridge Gas acknowledges that it is most unlikely that the OEB will be in a position to issue a final Decision and Order by August 31, 2021. It is the Company's expectation that this proceeding may extend well into 2022.

10. For this reason, Enbridge Gas is seeking approval from the OEB pursuant to an interim decision no later than August 31, 2021 approving the Company's proposed DSM activities in 2022 subject to necessary adjustments on a prospective basis following the OEB issuing its final Decision and Order in this proceeding, likely in early 2022. This would provide assurance to the Company and prospective DSM participants of program continuity which is an essential requirement for a successful, sustained and prosperous energy conservation market. This is consistent with both the joint letter from the Ministries of Environment and Energy to the OEB that stated, "Ensuring that an appropriate level of DSM programming remains available to natural gas customers without interruption will assist them in managing their energy costs, …"[3] and the DSM Letter where the OEB stated, "Enbridge Gas should specify in its DSM Plan application by when approval of its 2022 DSM Plan would be required in order to ensure program continuity."[4]

11. Enbridge Gas further seeks early approval from the OEB on a stand alone final basis of the budget proposed for 2022 as the "base budget envelope" for the 6 year DSM Plan and the escalation methodology which has been proposed which will increase the budget envelope in each year of the plan formulaically. Enbridge Gas notes that

[3] 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. https://www.oeb.ca/sites/default/files/ENDM-MECP-letter-to-OEB-20201127.pdf
[4] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

under the current Framework, the OEB set the parameters for the maximum budget which the legacy utilities could propose in their multi-year plans in the framework which the OEB approved before the legacy utilities were required to prepare and file their multi-year plans. In this proceeding, Enbridge Gas submits that it is in the interests of the OEB and all parties to have the issue of the annual budget settled by the OEB early and well in advance of the OEB and parties considering in great detail the program offerings, targets and metrics which make up the Company's proposed DSM Plan. Enbridge Gas developed its DSM Plan based upon the proposed budget envelopes. If there is a material change to the budget envelope, it may require significant and perhaps wholesale changes to the portfolio of program offerings. Accordingly, Enbridge Gas submits that an early decision of the OEB in respect of the base budget envelope and escalation methodology is critical. Enbridge Gas believes that this request to approve the modest budget increases that have been proposed is consistent with the directive of the OEB in this regard as stated in its DSM Letter.

12. Given the OEB's direction, Enbridge Gas submits that the issue of the 2022 base budget envelope and the proposal for formulaic increases thereafter should be the subject of a separate hearing process. The Company requests that the OEB issue an early final Decision and Order in respect of these matters by July 30, 2021. With an early decision from the OEB, all parties can then turn their attention to the details of the DSM Plan that has been proposed. In an effort to expedite matters and avoid the time that would be required to receive and respond to written interrogatories from intervenors in respect of the proposed 2022 base budget envelope and the annual escalation methodology, Enbridge Gas requests that the OEB provide for a "DSM Plan Introduction Day" where the Company would make an introductory presentation of the DSM Plan followed by an oral question and answer session with OEB Staff and intervenors. The Company would invite questions from intervenors in respect of the proposed base budget envelope and escalation methodology and the DSM program activities proposed for 2022. This session could be transcribed making it a possible substitute for written interrogatories in respect of the proposed base budget envelope

and escalation methodology, and the DSM program activities proposed for 2022. Enbridge Gas respectfully requests a rapid separate hearing schedule that relates only to these issues that allow the OEB to issue a final Decision and Order by July 30, 2021.

13. Enbridge Gas hereby applies to the OEB, pursuant to the provisions of the *Ontario Energy Board Act, 1998*, as amended, and the OEB's Rules of Practice and Procedure for the following final, interim or other decisions, orders and directions as may be appropriate in relation to this Application and the proper conduct of the proceeding:
    i. necessary procedural orders providing for the OEB's consideration of the proposed 2022 base budget envelope and escalation methodology through a separate expedited hearing process leading to an early final Decision and Order by July 30, 2021 in respect of these issues;
    ii. necessary procedural orders providing for the OEB's consideration of the DSM activities proposed by Enbridge Gas for the 2022 DSM program year leading to an interim Decision and Order by August 31, 2021;
    iii. necessary procedural orders providing for the OEB's consideration of the balance of this Application;
    iv. a final Decision and Order by July 30, 2021 in respect of the base budget envelope for the 2022 DSM program year and the methodology by which this base budget will be increased annually during the balance of the term of the DSM plan;
    v. an interim Decision and Order by August 31, 2021 approving Enbridge Gas' DSM activities for the 2022 DSM program year; and
    vi. a Final Decision and Order approving the balance of this Application by February 28, 2022.

14. The persons affected by this Application are the customers resident or located in the municipalities, police villages, and Indigenous communities served by Enbridge Gas,

together with those to whom Enbridge Gas sells gas, or on whose behalf, Enbridge Gas distributes, transmits or stores gas. It is impractical to set out the names and addresses of all the customers because they are too numerous.

15. Enbridge Gas requests that all documents relating to this application and its supporting evidence, including the responsive comments of any interested party, be served on:

The Applicant:

Regulatory Contact:

Ms. Asha Patel
Technical Manager, Regulatory Applications
Enbridge Gas Inc.

Address for personal service:	500 Consumers Road Willowdale, Ontario M2J 1P8
Mailing address:	P. O. Box 650 Scarborough, Ontario M1K 5E3
Telephone:	416-495-5642
Email:	Asha.Patel@enbridge.com EGIRegulatoryProceedings@enbridge.com

The Applicant's counsel:

Dennis M. O'Leary
Aird & Berlis LLP

Address for personal service and mailing address:	Brookfield Place, Box 754 Suite 1800, 181 Bay Street Toronto, Ontario M5J 2T9
Telephone	(416) 865-4711
Email:	doleary@airdberlis.com

Dated: May 3, 2021

ENBRIDGE GAS INC.

(Original Digitally Signed)

Asha Patel
Technical Manager, Regulatory
Applications, Regulatory Affairs

ENBRIDGE GAS INC. 2022-2027 DSM PLAN APPLICATION -TOPICS LIST

Early Decision and Interim Decision

1. DSM Budget Envelope/2022 Base Budget and Annual Escalation Methodology
2. 2022 DSM Program Activities

The DSM Plan Other Issues

3. Guiding Principles and the Proposed Framework
4. DSM Plan Program Offerings & Targets
5. Shareholder Incentives/Metrics/Scorecards
6. Program Evaluation
7. Input Assumptions & Cost Effectiveness Screening
8. Avoided Costs
9. Accounting Treatment: Recovery and Disposition of DSM Amounts
10. IRP
11. Other

GLOSSARY OF TERMS AND ACRONYM LEGEND

GLOSSARY

Annual Fuel Utilization Efficiency ("AFUE")	AFUE is the average annual thermal efficiency of equipment reflecting the seasonal and other shorter term variations in operating efficiency. It is also defined as the ratio of useful output energy to input energy.
Adjustment Factor	An adjustment factor reflects the percentage of savings being claimed as a result of Net-to-Gross Adjustments and Verification Adjustments.
Audit (DSM)	The DSM audit is the annual process through which an independent third party ("Evaluation Contractor") verifies Enbridge's DSM results, LRAM, and Shareholder Incentive amounts.
Avoided Costs	Assumptions relating to the benefit of not having to supply an extra unit of natural gas or other resource (e.g., electricity, heating fuel oil, propane, or water) through the delivery of DSM programs
Base Case (or Baseline)	The base case or baseline is a frame of reference which represents either the existing condition, the code compliant requirement, or the standard practice.
Building Envelope	The material separation between the interior and the exterior environments of a building. The building envelope serves as the outer shell to protect the indoor environment as well as to facilitate its climate control.
Code	An action or standard required by local or federal laws for safety, environmental, or other reasons. For example, a building code that requires a minimum fuel efficiency for furnaces.
Conservation Demand Management ("CDM")	Ontario electric industry energy conservation program roughly equivalent to Ontario natural gas industry based Demand Side Management (DSM) program.

Custom Project Savings Verification (“CPSV”)	The savings verification process by which the gross savings estimates of Enbridge Gas’s custom DSM projects are assessed by an independent third party evaluator.
Discount Rate	The interest rate used to translate the value of benefits and costs incurred in future years into present day values.
Early Replacement (“ER”)	A measure category where a utility energy efficiency program has caused a customer to replace operable equipment with a higher efficiency alternative (also referred to as advancement).
Effective Useful Life (“EUL”)	The number of years that a new piece of equipment or process is expected to remain in service and in good operating condition (also referred to as measure life).
EGD Rate Zone	The geographic areas within which the Company provides services formerly provided by Enbridge Gas Distribution Inc. prior to its amalgamation with Union Gas Limited on January 1, 2019.
End Use	The final application or final use to which energy is applied (e.g. water heating or space heating).
Energy Audit	An on-site inspection and cataloguing of energy, which can include equipment/buildings, energy consumption and the related end-uses, sometimes also referred to as Energy Assessment.
Energy Savings	The reduction in energy consumption resulting from implementation of energy efficient equipment or processes.
Evaluation Advisory Committee (“EAC”)	The EAC provides input and advice to the OEB on the evaluation and audit of DSM results.
Evaluation Contractor (“EC”)	The EC (sometimes referred to as the DSM Auditor) is the independent third party that executes impact evaluation, TRM updates and annual verification activities for Enbridge Gas’s DSM programs.
Evaluation, Measurement & Verification (“EM&V”)	The process of assessing the impacts and effectiveness of a DSM program on its participants and/or the market.

Free Rider / Free ridership	Free riders are program participants who would have installed the energy efficient measure or practice without the influence of the utility. Free ridership refers to the portion of gross savings not influenced by the utility. Gross savings attributed to a DSM offering are often adjusted downward to account for free ridership.
Gross Measurement	The method(s) used by the program administrator (Enbridge Gas) to determine the gross resource savings claimed by a DSM program offering.
Gross Savings	The amount of natural gas or other resource savings claimed by the utility regardless of whether the utility has influenced these savings. Gross savings are converted to net savings through application of a Net-to-Gross (“NTG”) factor.
Impact Evaluation	Post-implementation assessment and evaluation of the results of DSM program offerings.
Incentive	An incentive is generally a financial payment from the utility to encourage participation in a DSM program. Incentives can be paid to customers, vendors, or other parties.
Incremental Cost	The incremental cost is the difference in cost between the high efficiency technology and the baseline technology. The incremental cost includes incremental installation costs where appropriate.
Industry Standard Practice (“ISP”)	A common practice used within an industry but not formally defined by code or regulation.
Input Assumption	Assumptions such as operating characteristics and associated units of resource savings for a list of DSM technologies and measures. These cover a range of typical DSM activities, measures and technologies with residential, low-income, commercial and industrial applications.
Lost Opportunity	DSM opportunities that, if not undertaken during a current planning period, will no longer be available or will be substantially more expensive to implement in a subsequent planning period.

Lost Revenue Adjustment Mechanism ("LRAM")	The OEB's approved method by which the utility recovers distribution revenues lost due to customers reducing gas consumption by participating in DSM activities.
Market Transformation Program	Market Transformation programs are focused on helping to facilitate fundamental changes that lead to greater market adoption of energy-efficient products and services. These programs should also focus on influencing consumer behaviour and attitudes that support reduction in natural gas consumption. They are designed to make a permanent change in the marketplace over a long period of time.
Measure	Equipment, technology, process, practice, or behavior that, once installed or working, results in a reduction in natural gas use (not to be confused with "to measure" defined as estimate or assess the extent, quality, value, or effect of (something)).
Metric	A metric is the unit used to assess the performance of a DSM offering or program.
Multi-Residential Building	Property used for residential purposes that typically has seven or more self-contained units, though some buildings may deviate from this general description. Also referred to as Multi-Unit Residential Building ("MURB").
National Account	National Account customers are those customers that have multiple property locations and are similar in design and use. National Account customers include retail chains, property management firms and foodservice chains.
Natural Replacement	A measure category where the equipment is replaced on failure or where a utility energy efficiency program has not influenced the customer decision to replace but once the decision has been made, the utility program influences a higher efficiency alternative. Also referred to as a Replace on Burnout ("ROB").
Net Benefits	It is a measure of all the benefits realized as a result of the underlying DSM activity, minus the cost to achieve the benefit, expressed in present value. Mathematically, it is the difference of the TRC-Plus Benefits (see TRC-Plus Benefits definition) and the TRC costs (see TRC Costs definition).

Net Present Value ("NPV")	The NPV is the sum of the discounted yearly benefits arising from an investment over the lifetime of that investment.
Net Savings	Energy or natural gas savings that have been adjusted for net to gross or other adjustment factors as necessary.
Net-to-Gross Ratio	The ratio of net savings to gross savings for a particular DSM offering, program, or measure type. The ratio accounts for the amount of savings claimed by the utility that it has influenced. The ratio includes consideration of free ridership and spillover.
New Construction Measures	Efficiency measures in new construction or major renovations, whose baseline would be the relevant code or standard market practice.
Non Energy Benefits ("NEBs")	The wider socio-economic or environmental outcomes that arise from energy efficiency improvements, aside from energy savings. NEBs can include but are not limited to impacts such as improved safety, improved health, and job creation. For example, offering participants may benefit from increased property value, and improved health and comfort. The TRC-Plus test includes a 15% adder to the benefits calculation to account for NEBs.
Offering (DSM)	One or more DSM activities or measures which a utility may use to affect a specifically identified target market in their choices around the amount and timing of energy consumption.
Part 3 Building	As referenced in the Ontario Building Code, buildings exceeding 600 square meters in building area or exceeding three stories in building height and used for residential, businesses, mercantile or medium to low hazard industrial occupancies, as defined under Building Code Act, 1992, S.O. 1992, C.23.
Part 9 Building	As referenced in the Ontario Building Code, all buildings of three or fewer stories in building height, having a building area not exceeding 600 square meters, and used for residential occupancies, businesses, mercantile, or low hazard industrial occupancies, as defined under Building Code Act, 1992, S.O. 1992, C. 23.

Participant	An individual, household, business or utility customer that participates in a DSM offering.
Persistence	The extent to which a DSM measure remains installed and performing relative to its original effective useful life.
Portfolio (DSM)	A group of DSM programs which have been selected and combined in order to achieve the objectives of a utility's DSM Plan.
Program (DSM)	The programs outlined in Enbridge's Multi-Year Plan (Residential, Low Income, Commercial, Industrial, Large Volume, Building Beyond Code, Energy Performance and Low Carbon Transition Programs) are comprised of one or more offerings and address the needs of a subset of Enbridge's customer base.
Program Costs	For the purpose of the TRC-Plus test, program costs related to DSM programs include the following components: development and start up, promotion, delivery, evaluation, measurement and verification, and administration.
Remaining Useful Life ("RUL")	The number of years that an existing piece of equipment or process is expected to have remained in service and in good operating condition had it not been replaced through participation in a DSM offering. Also referred to as the Early Replacement ("ER") Period.
Resource Acquisition Program	Resource Acquisition programs are those that seek to achieve direct, measurable savings customer-by-customer and often involve the installation of energy efficient equipment or may involve the adoption of more energy efficient operations or the implementation of process improvement(s) to optimize energy use.
Retrofit	A measure category that includes the addition of an efficiency measure to an existing facility such as insulation or air sealing to control air leakage.
Scorecard	A Scorecard is a grouping of metrics for related DSM offerings. The utility is scored according to achievements on the metrics within a scorecard and can earn a Shareholder

Incentive once a certain scorecard achievement is reached. The utility can earn on each scorecard individually.

Sector — A market category that shares a common type of economic activity. Residential, commercial and industrial are commonly referenced sectors for the purposes of delivering DSM programs.

Shareholder Incentive (“DSMI”) — Shareholder incentives are intended to motivate the gas utility to both actively and efficiently pursue DSM savings and to recognize performance. These incentives are achieved through various mechanisms and may support multiple objectives.

Single Family Building — Property used for residential purposes that typically has less than seven self-contained units. Generally, this includes single detached, semi-detached, row house and/or duplex though buildings may deviate from this general description.

Social and Assisted Housing — Social and Assisted Housing, for the purposes of DSM Low Income programming includes:

- Non-profit providers of social or assisted housing under a federal, provincial, or municipally funded program, and includes, without limitation, non-profit corporations governed by the Housing Services Act, 2011 (as amended or any successor legislation);
- Public housing corporations owned by municipalities directly or through local housing corporations;
- Non-profit housing co-operatives as defined in the Co-operative Corporations Act;
- Non-profit housing corporations that manage or own residential (including multi-residential) buildings developed under the “Affordable Housing Program”; and,
- Non-profit organizations, or municipal or provincial governments that manage or own residential (including multi-residential) supportive housing, shelters, and hostels.

Spillover Effects — Spillover effects refer to energy savings associated with customers that adopt energy efficiency measures because they are influenced by a utility’s program related information and marketing efforts, but do not actually participate in the

	program. Gross savings attributed to a DSM offer are often adjusted upward to account for spillover effects.
Technical Reference Manual ("TRM")	The TRM is a document that is filed with the OEB that provides essential information and source materials underpinning prescribed energy savings assumptions and/or calculations for a number of energy efficient technologies that are or may be promoted by the Ontario gas utility energy efficiency programs.
Total Resource Cost ("TRC")-Plus Test	The TRC-Plus test is a screening mechanism intended to measure the benefits (see TRC-Plus Benefits definition) and costs (see TRC Costs definition) of a DSM portfolio or DSM programs for as long as those benefits and costs persist.
TRC-Plus Benefits	TRC-Plus Benefits are generally expressed as the net present value of Avoided Costs. They are driven by avoided resource costs, which are based on the marginal costs avoided by not producing and delivering the next unit of natural gas to the customer. These include the benefits of gas as well as other resources saved through the DSM program, such as electricity, water, propane and heating fuel oil, including carbon. A 15% non-energy benefits adder is applied to each of these avoided resource costs (excluding carbon benefits).
TRC Costs	TRC Costs generally include the net present value of all program costs associated with delivering the program to the market (except incentives) in addition to participant incremental costs, incurred over the lifetime of a DSM Program or Portfolio.
TRC-Plus Ratio	The TRC-Plus Ratio is an expression (ratio) of benefits to costs and is applied to screen the cost effectiveness of a program or portfolio. If the ratio of the present value (PV) of benefits to the PV of the costs (the "TRC-Plus Ratio") exceeds 1.0, the DSM portfolio or program is considered cost effective from the perspective of the TRC-Plus Test as it implies that the benefits exceed the costs. Note: A TRC-Plus Ratio screening threshold of 0.7 is applied to the Low Income program but offerings also may be considered at a lower threshold.

Union Rate Zones	The geographic areas within which the Company provides services formerly provided by Union Gas Limited prior to its amalgamation with Enbridge Gas Distribution Inc. on January 1, 2019. Collectively, the Union North West, Union North East and Union South rates zones are referred to as “Union rate zones”.
Verification Adjustments	Verification adjustments are adjustment factors that reflect post-implementation assessments that have been conducted to verify actual installation of measures, as well as validate the calculations and inputs used to estimate savings claims.

ACRONYM LEGEND

AFUE	Annual Fuel Utilization Efficiency
AMR	Automatic Meter Reader
ASHP	Air Source Heat Pump
AUTUVA	Average Use True-Up Variance Account
CDM	Conservation and Demand Management
CEM	Comprehensive Energy Management
CHP	Combined Heat & Power
CPSV	Custom Project Savings Verification
DPC	Deferred Participant Cost
DSM	Demand Side Management
DSMI	Demand Side Management Incentive
DSMIDA	Demand Side Management Incentive Deferral Account
DSMVA	Demand Side Management Variance Account
EAC	Evaluation Advisory Committee
EC	Evaluation Contractor
EEP	Energy Efficiency Plan
EM&V	Evaluation, Measurement & Verification
EMIS	Energy Management Information System
ESA	Energy Solutions Advisor
ESNH	Energy Star for New Homes
EUL	Estimated Useful Life
EWRB	Energy and Water Reporting and Benchmarking
GDS	Green Development Standards
GHG	Greenhouse Gas
HER	Home Efficiency Rebate
IDP	Integrated Design Process

IESO	Independent Electricity System Operator
ISP	Industry Standard Practice
LDC	Local Distribution Company
LEAP	Low Income Energy Assistance Program
LIM	Low Income Measurement
LRAM	Lost Revenue Adjustment Mechanism
LRAMVA	Lost Revenue Adjustment Mechanism Variance Account
LTO	Limited Time Offer
M&V	Measurement and Verification
MURB	Multi-Unit Residential Building
MUSH	Municipal, University, School and Hospital
NAC	Normalized Average Consumption
NEB	Non-Energy Benefits
NECB	National Energy Code for Buildings
NPV	Net Present Value
NRCan	Natural Resources Canada
NTG	Net-to-Gross
NZER	Net Zero Energy Ready
O&M	Operations & Maintenance
OBC	Ontario Building Code
P4P	Pay for Performance
PCF	Pan Canadian Framework
PV	Present Value
RCx	Retro-Commissioning
RIF	Research and Innovation Fund
SBD	Savings by Design
SEM	Strategic Energy Management

SME	Subject Matter Expert
TAM	Target Adjustment Mechanism
TEDI	Thermal Energy Demand Intensity
TEUI	Thermal Energy Use Intensity
TGS	Toronto Green Standards
ToR	Terms of Reference
TRC	Total Resource Cost
TRM	Technical Resource Manual

OVERVIEW, BACKGROUND AND CONTEXT

1. Enbridge Gas Distribution Inc. ("EGD") and Union Gas Limited ("Union") (collectively, the "Utilities") were Ontario corporations incorporated under the laws of the Province of Ontario carrying on the business of selling, distributing, transmitting, and storing natural gas pursuant to the provisions outlined in the Ontario Energy Board Act, 1998 (the "Act"). EGD and Union amalgamated effective January 1, 2019, to become Enbridge Gas Inc. ("Enbridge Gas" or the "Company").

2. The original regulatory framework governing demand side management ("DSM") activities in Ontario's natural gas sector was established in 1993 under EBO 169-III. Since that time the Ontario Energy Board ("OEB") has been promoting DSM and approving natural gas DSM plans for the gas utilities through the release of guidelines, frameworks, and other directional documents which informed the Utilities in respect of the design, operation, approval and recovery of DSM program activities and cost recovery.

3. The OEB's objectives for natural gas, as defined in the *Ontario Energy Board Act, 1998*, include both "to protect the interests of consumers with respect to prices…" and "to promote energy conservation and energy efficiency in accordance with the policies of the Government of Ontario, including having regard to the consumer's economic circumstances".[1]

4. Since the inception of DSM, both Utilities and now Enbridge Gas have been enthusiastic supporters of the efficient use of natural gas and the associated reductions in greenhouse gas emissions which the Company helps to facilitate with the reduction in natural gas usage relative to what would have occurred but for the Company's DSM activities. Enbridge Gas is proud of its energy efficiency efforts to

[1] Ontario Energy Board Act, 1998, S.O. 1998, c.11 as amended.

date and is pleased with recent communications from the Ontario government in both the Made in Ontario Environment Plan and the November 27, 2020 joint letter from the Ministry of Energy and the Ministry of Environment, Conservation and Parks, to the OEB confirming the government's continuing support for gas utility delivered natural gas conservation programs, acknowledging their important role in helping to achieve provincial greenhouse gas emissions. As the effective natural gas system operator for Ontario, Enbridge Gas expects to play an integral role in both contributing to Ontario's economy and supporting provincial GHG emission reduction targets for many years to come.

5. On December 22, 2014, the OEB issued the 2015-2020 Demand Side Management Framework and Guidelines for Natural Gas Utilities (EB-2014-0134) ("2015-2020 DSM Framework"). On January 20, 2016 and on February 24, 2016, the OEB issued its Decision and Order and Revised Decision and Order, respectively, on the 2015-2020 DSM Plans (EB-2015-0029/0049) for the Union rate zones and EGD rate zone.

6. On May 21, 2019 the OEB initiated the initial phase of the OEB's Framework Consultation[2] process (the "Consultation"). The purpose of the Consultation was to establish a new DSM Framework that would replace the current 2015-2020 DSM Framework which was set to expire December 31, 2020. On December 1, 2020, the OEB issued a letter (the "DSM Letter")[3] to Enbridge Gas communicating that it had concluded the Consultation process in favour of an adjudicative process and invited Enbridge Gas to file a comprehensive multi-year DSM plan application for the post-2021 period.

7. In accordance with direction provided in the DSM Letter, Enbridge Gas makes this submission which includes two distinct sections:

[2] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (May 21, 2019).
[3] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020).

1. Proposed DSM Framework effective 2022 (**“Proposed Framework”**)
2. 2022-2027 Multi-Year DSM Plan (**“DSM Plan”**)

8. The Application should be reviewed and evaluated in its entirety as the two sections are not separable in that the Proposed Framework has informed the development of the DSM Plan. More specifically, the DSM Plan, which can be found at Exhibits D to F, has been designed based on the constructs outlined in the Proposed Framework which can be found at Exhibit C, Tab 1, Schedule 1. Due to this dependency, it should be noted that any changes to the Proposed Framework as a result of this proceeding will likely require Enbridge Gas to reconsider and/or revise components of the DSM Plan. It should also be noted that the Application includes certain proposals for provisions which relate to the 2022 program year which are intended to provide continuity in the delivery of DSM programming between 2021 and 2022.

<u>Response to the DSM Letter</u>

9. The following paragraphs address the various objectives and directions Enbridge Gas received in the DSM Letter, and provides a high level overview of the approach taken by Enbridge Gas to address them in the DSM Plan. It should be noted that the overall intent of the proposed DSM Plan is an effort to respond to the collective aims and guidance provided by the OEB with a balanced approach that allows conservation programming to continue to effectively serve Ontarians.

10. The DSM Letter states: “the **<u>primary objective</u>** [*emphasis added*] of ratepayer-funded natural gas DSM is assisting customers in making their homes and businesses more efficient in order to help better manage their energy bills.”[4]

[4] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.

11. And: "In working towards the primary objective, Enbridge Gas's future ratepayer-funded DSM plan should also consider the following **secondary objectives** [*emphasis added*]:
    - Help lower overall average annual natural gas usage
    - Play a role in meeting Ontario's greenhouse gas reductions goals
    - Create opportunities to defer and/or avoid future natural gas infrastructure projects"[5]

12. And: "These secondary objectives balance input received from stakeholders and refine the objectives included in the former 2015-2020 DSM framework."[6]

13. This Application includes a Proposed Framework that is significantly based on the previous framework but with appropriate revisions based on the feedback of stakeholders shared during the OEB's post-2020 framework consultation and the Company's decades of experience in delivering DSM programming. The DSM Plan is built on this Proposed Framework and in response to the primary and secondary objectives set out by the OEB.

14. The DSM Letter states: "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"[7]

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

15. And: "...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."[8]

16. To be responsive to the OEB's direction, the DSM Plan proposes a 2022 base year budget with a 2.95% increase over the OEB approved 2021 budget, balancing near term COVID-19 related bill impacts with modest increases to assist customers in managing their energy bills. Thereafter, proposed program budgets formulaically increase by 3% over inflation, with portfolio overheads held to only inflation increases for the 2023-2027 period. This focuses the year-over-year increases on the programming directed to help customers manage their energy bills and demonstrates the Company's commitment to cost-effective program delivery.

17. The DSM Letter also states: "The OEB expects that all requests for ratepayer-funding to support DSM programs be accompanied by detailed evidence that shows how the programs will benefit Ontario's natural gas customers, help reduce overall natural gas usage and costs, and contribute towards meeting the Government's goals to reduce greenhouse gas emissions."[9]

18. The proposed DSM Plan continues the majority of existing programing with refinements and enhancements and includes expanded programming for retrofit opportunities. In addition, a new program for new construction to align with advancing building codes has been introduced, as well as a Low Carbon Transition program aligned with the aspirational goals of the Pan Canadian Framework which is driving toward greater than 100% efficiency heating equipment.

---

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

19. The DSM Letter states: "...the level of natural gas savings achieved through DSM programs for each dollar spent has been decreasing. This may be related to Enbridge Gas striving to meet a number of different priorities, programs being extended to harder-to-reach customers, and recent updates to outdated assumptions."[10] And: "The OEB expects Enbridge Gas to seek out elements of current programs that can be modified and consider new programs in order to optimize overall program results to make the best use of ratepayer funding"[11]

20. The proposed DSM Plan balances multiple objectives, with increased investment in select program areas to broaden participation balanced by increased resourcing in the more cost-effective program areas.

21. The DSM Letter states: "Additionally, consistent with the Ministerial Directive issued to the Independent Electricity System Operator (IESO) on September 30, 2020, the OEB expects that Enbridge Gas will endeavor to coordinate the delivery of DSM programs with electricity CDM programs where possible, including modifying the participant eligibility requirements of its current low-income program in order to be consistent with the electricity income-tested CDM program eligibility requirements."[12]

22. The proposed DSM Plan includes updates to low income eligibility requirements to align with electricity program requirements, including plans for a similar Tier 2 (moderate income) focus, and addresses ongoing efforts to coordinate delivery with IESO where discussion are advancing but contractual commitments have not yet been established.

23. The DSM Letter also states: "Additional metrics should also be proposed to ensure all segments of the market are reached …The OEB encourages Enbridge Gas to

---

[10] Ibid, pp. 3-4.
[11] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.
[12] Ibid.

develop a longer-term natural gas savings reduction target, separate from the annual targets, that it will work to achieve by the end of the next multi-year DSM term."[13]

24. The proposed DSM Plan has a four pronged approach for shareholder incentives that align customer and company interests, including a long-term GHG reduction target. An infographic of the proposed four pronged approach including this long term objective is include in Exhibit D, Tab 1, Schedule 2 (infographic reference), and the GHG reduction target is explained in Exhibit D, Tab 1, Schedule 3.

<u>Proposed Framework</u>

25. In prior years the OEB first issued a DSM Framework after which the Utilities would then prepare and file a DSM Plan. The Company notes that the 2015-2020 DSM Framework will expire at the end of 2021 and that the Consultation which was examining a new framework has concluded. As such, in order to put forward a Multi-Year DSM Plan which meets the primary and secondary objectives as stated in the DSM Letter[14], Enbridge Gas finds it necessary to propose a DSM Framework as part of this Application that serves as the foundation for the 2022-2027 DSM Plan.

26. The Proposed Framework is intended to support Enbridge Gas in defining the approved parameters upon which it will operate its DSM programs. The Proposed Framework builds on the 2015-2020 DSM Framework, and has been informed by subsequent OEB direction including the mid-term review, feedback from the Consultation, as well as lessons learned by Enbridge Gas given its long standing experience successfully delivering DSM programming for over 25 years with consideration of the current energy environment within which it is operating.

[13] Ibid, p. 5.
[14] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

27. It is important to acknowledge that Ontario's DSM frameworks have consistently maintained the goal of facilitating energy efficiency and conservation of natural gas in a manner that benefits natural gas ratepayers through, inter alia, bill reductions while at the same time making the shareholder eligible to earn an incentive and providing certainty that the utility is not unduly exposed to risk. As has been the case with prior frameworks, in order to provide the necessary context for a new multi-year DSM Plan, the requirement for a clear framework that is understood by all stakeholders is paramount.

28. The Proposed Framework is crucial as it articulates policy objectives and guiding principles and because it details the execution components upon which Enbridge Gas has built its DSM Plan. A framework that clearly defines the goals and "rules" of DSM planning and delivery is fundamental to avoiding potential contentious litigation in the assessment of results throughout the life of the DSM Plan.

29. The Proposed Framework is to be effective January 1, 2022 with no end date (i.e., no defined term). Having no "sunset" on the next DSM framework was brought forward and discussed during the Post-2020 DSM Framework consultation. Enbridge Gas is of the view that without an end date, the Proposed Framework can serve as a framework for future DSM Plans beyond the DSM Plan being proposed in this Application. It is the Company's expectation that it will propose appropriate evolutionary changes to the framework approved by the OEB in this proceeding as part of the next multi-year DSM Plan filing likely in 2026. It is however important to note that while the Proposed Framework does not have a term end date, the DSM Plan and associated budgets do have a specified term length.

<u>DSM Plan Term</u>

30. The DSM Letter stated: "The OEB expects that Enbridge Gas's new multi-year DSM plan will be for a minimum term of three years up to a maximum of six years, including

2022."[15] The letter further outlined: "At a minimum, the OEB expects Enbridge Gas to submit an application for a new DSM plan that includes proposed targets, budgets, programs, and performance metrics no later than May 1, 2021."[16] [17]

31. The DSM Letter further stated that:

> Enbridge Gas may consider it necessary to maintain some elements from its 2021 DSM Plan as part of its proposed 2022 DSM Plan to potentially act as a transition to the next multi-year DSM plan. Enbridge Gas should specify in its DSM Plan application by when approval of its 2022 DSM Plan would be required in order to ensure program continuity. Alternatively, Enbridge Gas may file a separate application for 2022.[18]

32. As reflected in this Application, detailed further below, Enbridge Gas seeks an interim order from the OEB by August 31, 2021 dealing with 2022 DSM activities in an effort to ensure continuity and certainty for 2022 leading to the complete roll out of the multi-year plan approved by the OEB in this proceeding.

33. Enbridge Gas proposes a six-year DSM Plan that provides for regulatory efficiency and is supportive of government policy but is also flexible to adapt to policy changes that may occur during the plan term. A six-year term allows for long term planning and program continuity while minimizing the need for redundant regulatory review. A six-year term provides stability for the Company to commit to energy conservation efforts, as well as certainty for customers and other market participants of sustained DSM support across Ontario.

34. As acknowledged in the November 27, 2020 letter from the Ministry of Energy, Northern Development and Mines to the OEB, "DSM programs help customers

---

[15] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 1.
[16] Ibid, p. 4.
[17] May 1, 2021 is a Saturday, as such Enbridge Gas is filing the multi-year DSM application on May 3, 2021.
[18] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

manage their energy costs and are an important contributor to Ontario's economy."[19] In the wake of the COVID-19 pandemic, certainty and opportunity for contractors, delivery agents, vendors and manufacturers will be vital in the coming years. Therefore, Enbridge Gas is proposing a six-year DSM budget term which will consist of an initial three-year DSM plan proposal (2022-2024) designed to be continued for the remaining three-year period (2025-2027) following a mid-point assessment of those offerings and metrics that are identified in this Application as potentially requiring review and adjustment at that time.

35. Enbridge Gas believes it is appropriate and prudent to assess the program portfolio in specific areas towards the end of the first three-years of the plan to ensure the plan continues to be aligned with the market and evolving policy in Ontario. A limited mid-point assessment will provide an opportunity to determine if any additional program offerings merit introduction, or if changing market factors/government policy necessitate some re-consideration in program design or delivery. This may be particularly true in respect of certain multi-year program offerings which may require some adjustment or resetting of various metrics. The scope and purpose of the limited mid-point assessment is outlined in Exhibit D, Tab 1, Schedule 1.

<u>2022-2027 DSM Budget</u>

36. The OEB outlined its budget expectations in the DSM Letter stating:

> the OEB anticipates modest budget increases to be proposed by Enbridge Gas in the near-term in order to increase natural gas savings."[20] The OEB further detailed that "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.[21]

[19] Ministry of Energy, Northern Development and Mines, Letter to OEB (November 27, 2020), p. 2.
[20] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 3.
[21] Ibid.

37. It is appropriate to first identify the factual context in which the development of a budget for the 2022-2027 period was considered. The Company has been operating in 2021 with an approved DSM budget which is the same as that approved for 2020. There was no increase over the 2020 approved budget.

38. Given this and based on the above noted guidance from the OEB, Enbridge Gas is proposing a 2022 base year budget of $136 million for the first year of its 2022-2027 DSM Plan. This represents an increase of approximately 3% over 2021 (effectively 2020), budget levels which Enbridge Gas believes is a modest but appropriate increase. For the balance of the six-year budget term (2023-2027), Enbridge Gas proposes to escalate the entire 2022 base year budget of $136 million by a 2% inflation factor.[22] In addition, to support modest increases for the expansion of DSM programs, Enbridge Gas is proposing that the portion of the budget directly related to programs be escalated annually by an additional 3% to reflect Government policy that supports growth. Enbridge Gas submits that a formulaic budget increase of 2% inflation to the entire budget plus a 3% increase to program budgets (Portfolio Administrative costs, Evaluation and Regulatory costs, and Research and Development costs are not subject to the additional 3% increase), balances bill impacts with the level of natural gas savings being targeted in this DSM Plan. In this way, the administrative cost of undertaking DSM activities is being limited to inflationary increases only whereas program budgets will increase modestly by 3% over inflation to achieve Government of Ontario policy objectives while still being mindful of ratepayer impacts.

39. At a portfolio level, the six-year budget proposal is set out in Table 1 below. Details of the six-year budget can be found in Exhibit D, Tab 1, Schedule 1.

[22] 2% is the proxy for future inflation through the DSM Plan. The inflation factor will be adjusted as part of the annual rates proceeding in accordance with the Consumer Price Index (CPI).

Table 1: 2022-2027 Six-Year DSM Budget Envelope[23]

Six Year 2022+ DSM Multi Year Plan Portfolio Budget						
	2022 Base Year	**2023**	**2024**	**2025**	**2026**	**2027**
Program Budget	$118,000,000	$123,900,000	$130,095,000	$136,599,750	$143,429,738	$150,601,225
		Formulaic increase of 5% (3% policy growth + 2% inflation) over year prior				
Portfolio Admin, Evaluation, Research & Development	$18,000,000	$18,360,000	$18,727,200	$19,101,744	$19,483,779	$19,873,455
		Formulaic increase of 2% inflation over year prior				
Total Budget Envelope	$136,000,000	$142,260,000	$148,822,200	$155,701,494	$162,913,517	$170,474,680

40. Importantly, Enbridge Gas seeks early approval from the OEB in respect of the budgets proposed in the DSM Plan. For the reasons set out below, Enbridge Gas asks for a final Decision and Order from the OEB by July 30, 2021. As noted earlier, the OEB has in respect of prior frameworks set an annual budget which the natural gas utilities then relied upon to generate their multi-year plans. The Company believes that a great deal of procedural time and energy will be saved in this proceeding if the budget levels for the six year term of the DSM Plan have been set by the OEB before the proceeding begins to look in earnest at the details of program offerings, targets and program metrics. Stated simply, if there is a material change to the budgets proposed, there will need to be material and perhaps wholesale changes to the DSM Plan, the portfolio of program offerings, targets and metrics. DSM programming cannot simply be increased or decreased linearly based on the level by which budgets have been increased or decreased. It is the view of Enbridge Gas that a first critical step in approving a multi-year DSM plan is for the OEB to approve on an early basis the budget envelopes for each of the six years of the DSM Plan.

[23] Total Budget envelope amounts do not include potential shareholder incentive payment amounts.

41. The Company again notes the guidance from the OEB in the DSM Letter, namely, to propose modest budget increases. While Enbridge Gas acknowledges that different parties may have a different view of what a modest increase entails, the variance in views cannot be large given the OEB's further directive that "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". Together these directives indicate that the OEB does not expect nor has it invited a wholesale re-evalutaion of DSM budgets as part of this proceeding.

42. In an effort to expedite matters and avoid the time that would be required to receive and respond to written interrogatories from intervenors in respect of the proposed 2022 base budget envelope and the annual escalation methodology, Enbridge Gas requests that the OEB provide for a "DSM Plan Introduction Day" where the Company would make an introductory presentation of the DSM Plan followed by an oral question and answer session with OEB Staff and intervenors. The Company would invite questions from intervenors in respect of the proposed base budget envelope and escalation methodology and the DSM program activities proposed for 2022. This session could be transcribed making it a possible substitute for written interrogatories in respect of the proposed base budget envelope and escalation methodology and the DSM program activities proposed for 2022. Enbridge Gas requests that the OEB issue a procedural order which provides for this DSM Plan Introduction Day and an expedited hearing schedule leading to a decision in respect of the budget envelope and escalation methodology by July 30, 2021 Again, by making such an early decision, it will greatly expedite this Application relative to what will happen if the budget issue remains live throughout.

<u>2022 DSM Plan Continuity</u>

43. As noted earlier, the DSM Letter directed that "Enbridge Gas should specify in its DSM Plan application by when approval of its 2022 DSM Plan would be required in

order to ensure program continuity. Alternatively, Enbridge Gas may file a separate application for 2022."[24] As indicated above, Enbridge Gas's DSM Plan is designed to be in market beginning January 1, 2022 but to do so, given that a final Decision and Order in this matter from the OEB is not expected until perhaps later in 2022, the Company will require an interim order approving the 2022 transitional program year plan before a final Order and Decision is made in respect of the entire Application.

44. In order for Enbridge Gas to maintain program continuity into January 2022, it requires approval of the 2022 transitional program year plan by August 31, 2021. As Enbridge Gas believes that the regulatory process leading up to and including an OEB final Decision and Order in respect of this Application is very unlikely as a practical matter before August 31, 2021 and is more likely to go into early 2022, Enbridge Gas proposes that the 2022 program year DSM Plan be dealt with by means of an interim order.

45. Enbridge Gas faced a similar challenge of program continuity for its 2021 DSM year, and filed for approval of a roll-over of its approved 2015-2020 DSM Plan for use in 2021.

46. While this roll-over into 2021 was approved by the OEB, Enbridge Gas does not believe another roll-over of the 2015-2021 DSM Plans into 2022 is reasonable nor appropriate. The two legacy utilities amalgamated in early 2019 and by 2022 Enbridge Gas will be entering its fourth-year post amalgamation. Continuing to deliver two separate DSM plans, with separate scorecards, metrics and budgets which, in some cases, are proving not optimal given limitations adapting program requirements within the current portfolio, will not effectively serve customers. It also

[24] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.

poses challenges for Enbridge Gas to fully align and optimize delivery and will likely hamper results. Further, many stakeholders were not supportive of the roll-over in 2021 and they would likely be unsupportive once again of another roll-over for 2022. Simply stated, a further roll-over of the approved multi-year plan for 2015-2020 into 2022 would unnecessarily constrain the Company in its efforts to update and adjust program offerings and would not act as a true transition to the next generation multi-year plan. For example, approving a budget for 2022 which is in line with the budgets proposed for subsequent years will provide the flexibility to the Company to start expanding and adjusting program offerings immediately. It will also mean that the impact of the increased budget will be undertaken more smoothly rather than a larger jump to a higher budget in 2023 assuming the budget in 2022 were to again remain flat.

47. Enbridge Gas emphasizes the importance of program continuity as an essential requirement for a successful, sustained and prosperous energy conservation market. In order to confidently move forward, customers must be secure in the knowledge that their projects will not be jeopardized, and the Company and business partners must be clear on what plans and preparations are needed as the Company progresses into the 2022 program year. The importance of program continuity has also been acknowledged in both the Ontario government's November 27, 2020 letter to the OEB, and the subsequent DSM Letter dated December 1, 2020.

48. Notwithstanding receiving interim approval, it is important to note that Enbridge Gas would be assuming the full risk of the OEB making decisions in its final Decision and Order which might impact the shareholder incentive. The Company appreciates that the targets and metrics proposed for the 2022-2027 Multi-Year Plan may, in the end, be adjusted by the OEB in its final Decision and Order and that the OEB may order that these revised targets and metrics be applied to the 2022 program year. This

could have an impact on the shareholder incentive to which the Company may be eligible to receive.

49. This being said, Enbridge Gas requests that the OEB make it clear in any interim Decision and Order that the utility will be able to recover all reasonable costs, expense ad commitments that were incurred and made in undertaking DSM activities in 2022, including expenditures of up to 120 days after an OEB final Decision and Order is received in respect of the remainder of the DSM Plan. This is the minimum time period that the Company estimates that it will require to wind down activities not approved by the OEB.

50. Subsequent to this interim approval, Enbridge Gas requests that the final Decision and Order on the 2022-2027 Multi-Year DSM Plan Application be delivered not later than February 28, 2022. Further, Enbridge Gas requests that sufficient time be afforded the utility after February 28, 2022 to make any adjustments to its 2022 DSM Plan as may be required to meet with the specific elements of the OEB's final Decision and Order.

PROPOSED FRAMEWORK

Enbridge Gas Inc.

Proposed Demand-Side Management Framework

Effective Date: January 1, 2022

Table of Contents

Enbridge Gas DSM Framework
Effective January 2022

1. Background

On December 1, 2020 the OEB issued a letter to participants in the Post-2020 Natural Gas Demand Side Management Framework consultation (EB-2019-0003) indicating it was concluding the policy consultation. Through this letter, the OEB invited Enbridge Gas Inc. ("Enbridge Gas") to develop and file a comprehensive multi-year DSM plan application for the post-2021 period. The letter detailed the OEB's overall objectives for ratepayer funded DSM and provided key guidance on some of the main elements that would have been previously outlined in the DSM Framework.

Various elements intended to provide guidance to DSM planning and execution were previously addressed in two companion documents – the Demand Side Management Framework for Natural Gas Distributors (2015-2020) and the Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (EB-2014-0134).

This updated framework addresses the various elements related to DSM activities in a single document. Enbridge Gas has updated the combined 2015-2020 DSM Framework and Filing Guidelines by incorporating the OEB's direction in their December 1, 2020 letter, considering aspects of the OEB's Mid-Term Review Report as well as broader stakeholder feedback, to develop this new DSM Framework to be effective January 2022.

A good deal of the 2015-2020 Framework and Filing Guidelines remains appropriate, relevant, and applicable, however some elements have been modified or enhanced to address new information, or to incorporate lessons learned from DSM program delivery in recent years.

2. Objectives of Ratepayer Funded Natural Gas DSM

As outlined in the OEB's December 1, 2020 letter, following review and consideration of written comments from stakeholders, the OEB outlined both primary and secondary objectives of ratepayer funded DSM:[1]

Primary Objective: Assisting customers in making their homes and business more efficient in order to help better manage their energy bills.

In working towards the primary objective, Enbridge Gas's ratepayer-funded DSM plan should also consider the following secondary objectives:

- Help lower overall average annual natural gas usage.
- Play a role in meeting Ontario's greenhouse gas reductions goals.
- Create opportunities to defer and/or avoid future natural gas infrastructure projects.[2]

The OEB proposed that these secondary objectives balance input received from stakeholders and refine the objectives included in the former 2015-2020 DSM Framework. The OEB outlined that these secondary objectives are important considerations that a well-planned and effectively implemented DSM plan can help achieve.

3. Guiding Principles

In the 2015-2020 DSM Framework, the OEB outlined a list of guiding principles which it expected would help the gas utilities to develop their multi-year DSM strategies and

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[2] Ibid, reference: "DSM can avoid or defer infrastructure passively (by reducing overall natural gas use and infrastructure needs) or actively (by targeting specific infrastructure projects). The OEB has an ongoing hearing that is considering Enbridge Gas's proposed Integrated Resource Planning framework (EB-2020-0091). As part of that proceeding, the OEB will decide on the relationship between the IRP framework and future utility DSM plans and the extent to which Enbridge Gas will be expected to meet this secondary objective as part of its future DSM plan."

assess the appropriateness of their overall DSM plans.[3] The OEB solicited input on these guiding principles for consideration in an updated framework as part of the Post-2020 DSM Framework consultation (EB-2019-0003). Ultimately, the inclusion of a set of guiding principles was not specifically established in the OEB's December 1, 2020 letter, therefore the following guiding principles are based on the 2015-2020 Framework guiding principles updated to reflect feedback received from stakeholders and updated policy guidance from the OEB. These guiding principles are intended to support post-2021 DSM plan development.

- **DSM plans should balance the achievement of cost-effective natural gas savings and customer bill impacts. "**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. The OEB expects that all requests for ratepayer-funding to support DSM programs be accompanied by detailed evidence that shows how the programs will benefit Ontario's natural gas customers, help reduce overall natural gas usage and costs, and contribute towards meeting the Government's goals to reduce greenhouse gas emissions."[4]

- **DSM plans should be designed to provide opportunities for a broad spectrum of consumer groups and customer needs to encourage widespread customer participation over time and "ensure all segments of the market are reached."[5]** **"**Programs should be designed to remove financial, information and other barriers in the marketplace to increase uptake of DSM programs"[6] over time.

---

[3] EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 6.
[4] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 3.
[5] Ibid, p. 5.
[6] Consistent with: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p.8.

- **DSM plans should ensure that "small volume, low-income**[7] **and on-reserve First Nations communities are well-served."**[8] Income qualified programming should be screened at a lower threshold than other programming and be available across the province.[9]

- **DSM plans should include strategies to increase the natural gas savings by targeting key segments of the market and customers with significant room for efficiency improvements.**[10]

- **DSM plans should minimize lost opportunities for energy efficiency and should be designed to pursue long term energy savings.** DSM programming should pursue opportunities such as replacement of equipment with long lives that, if not undertaken during the current planning period, will no longer be available or will be substantially more expensive to implement in a subsequent planning period.[11]

- **Where appropriate, Enbridge Gas should coordinate DSM and electricity CDM efforts.**[12] "Consistent with the Ministerial Directive issued to the Independent Electricity System Operator (IESO) on September 30, 2020, the OEB expects that Enbridge Gas will endeavor to coordinate the delivery of DSM programs with electricity CDM programs where possible."[13]

---

[7] As per: EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5 - the OEB expects Enbridge Gas will modify low income participant eligibility requirements to be consistent with the electricity income-tested CDM eligibility requirements.
[8] Ibid.
[9] Consistent with: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p.8.
[10] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.
[11] Adapted from: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p.8.
[12] Consistent with: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 5 and p. 8.
[13] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.

- **Enbridge Gas should not have a disincentive to coordinate DSM efforts with external energy conservation and carbon reduction initiatives**. Enbridge Gas should endeavor, where appropriate, to coordinate its DSM activities with other external parties such as government partners, to achieve efficiencies and maximize results.[14]

- **DSM plans should support innovation, technology development and adoption of lower-carbon alternatives to enable longer term energy efficiency and conservation opportunities, consistent with the advancement of provincial policy goals.[15]**

- **Enbridge Gas will be able to recover costs and lost revenues associated with the delivery of DSM plans.** Enbridge Gas will be permitted to recover spending associated with the administration and delivery of DSM programs, lost revenues, and shareholder incentive amounts.[16]

- **Shareholder Incentives will be commensurate with both performance and efficient use of funds.**[17] The amount of shareholder incentive will depend on performance against DSM targets, and will take into consideration the relative difficulty in achieving other objectives and guiding principles Enbridge Gas is expected to achieve. In addition, shareholder incentive will be in part directly related to the achievement of net benefits.

---

[14] Consistent with: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014); EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), pp. 2- 4; and the current energy market.
[15] To reflect direction outlined in: A Made in Ontario Environment Plan, Ministry of the Environment, Conservation and Parks (November 29, 2018), p. 18; "our government will focus on smart regulatory and policy approaches to facilitate and enable innovation rather than hindering it."
[16] Adapted from: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 8.
[17] Consistent with: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 9.

4. DSM Budgets

In order to fund the costs of administering and delivering DSM programs, including marketing efforts, financial incentives to participants, and educating consumers, long-term and annual DSM budgets must be developed that will enable the achievement of DSM objectives over the duration of a DSM plan period.[18]

The OEB's objectives with respect to natural gas include the requirement to protect the interests of consumers with respect to prices, reliability, and quality of gas service. The OEB also has an objective to promote energy conservation and energy efficiency but with consideration for the consumer's economic circumstances. Therefore, in approving any budget amount, it is necessary for the OEB to consider the rate impacts, or overall cost impacts, to customers, as all DSM costs are recovered through distribution rates.[19]

In its December 1, 2020 letter, the OEB outlined its budget expectations, stating "the OEB anticipates modest budget increases to be proposed by Enbridge Gas in the near-term in order to increase natural gas savings."[20] The OEB further detailed that "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."[21]

The above directive of the OEB is a reflection of the fact that while some customers will participate in the programs offered by Enbridge Gas and benefit from the natural gas savings, given DSM budget constraints and for other reasons, many customers will not participate. Many elements of DSM programs that offer the greatest opportunity to realize long-term natural gas savings (and bill reductions) are related to the installation of energy efficient products, such as a furnace or insulation. The opportunity to install

[18] Consistent with: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 13.
[19] Consistent with: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020), (December 22, 2014), p. 17.
[20] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 3.
[21] Ibid.

one or more of these more significant items will not be present for the majority of customers in Enbridge Gas's service territory. As a result of this, the many customers who do not participate in any DSM program end up cross-subsidizing, through natural gas distribution rates, energy efficiency upgrades for those customers who do participate. Because of this, the OEB must be mindful of the overall impact additional costs have on all customers (both participants in DSM programs and non-participants).[22]

Based on the OEB's directive, Enbridge Gas will propose a budget for the first year of its Multi-Year DSM Plan that reflects modest increases relative to 2021 budget levels (which were held flat at 2020 levels). Subsequently, at a minimum, this first year budget should be increased annually for inflation over the course of the multi-year plan.

5. DSM Targets

A target refers to the level against which the actual result of a DSM program offering will be assessed. A target level could be set at a metric level (e.g., saving 100,000 m^3 of natural gas) and at a scorecard level (e.g., achieving score of the combined scorecard metrics of 100%).

DSM targets, including annual natural gas savings targets and other performance metrics are the achievement standards that Enbridge Gas will strive to accomplish (or exceed), both annually and throughout the term of the DSM plan.

5.1 Annual Targets

Enbridge Gas has extensive DSM program experience and an understanding of future program opportunities, market knowledge of industry capacity, and program deployment

[22] Consistent with: EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 15.

strategy to propose appropriate annual natural gas savings targets and other performance metrics for the OEB's consideration.

Enbridge Gas will specify metrics to drive results based on the objectives of a given DSM program offering with consideration for budget parameters established for the DSM portfolio. It is anticipated that net annual natural gas savings targets (m^3), will be set for most resource acquisition type program offerings. The annual savings targets proposed will be informed by the following: an updated analysis of the level of natural gas energy efficiency potential available in Ontario; market opportunities; past DSM program experience; new innovations; and, industry capacity to deliver DSM program offerings.

In most cases, targets will be set for the first year of the multi-year plan and be determined in subsequent years by a Target Adjustment Mechanism ("TAM") detailed further in section 5.2. In some cases, DSM program offerings may be "multi-year" in nature, such that activities and participant involvement may span more than one year and may include a progression of related activities or an initial ramp-up in the first year(s). The annual targets for these program offerings should reflect the relative activities year to year and consideration should be given as to whether different metrics and targets are appropriate to reflect the objective during the ramp-up period and as the program offering evolves. In these cases, Enbridge Gas will specify metrics and propose targets for each year of the multi-year plan and the TAM will not apply to these metrics.

Enbridge Gas will propose targets for metrics specified across defined scorecards. Three levels of achievement will be established for each individual metric on a given scorecard: one at 50%, 100% and 150%. To achieve the maximum shareholder incentive designated for achievement on each scorecard, Enbridge Gas will be required to meet the maximum score of 150% on the respective scorecard. No shareholder incentive will be paid on a given scorecard for achieving a scorecard weighted result of less than 50%. For a given scorecard, one-half (50%) of the maximum shareholder incentive designated to that scorecard will be awarded for a weighted scorecard performance of 100% on that scorecard. Where more than one metric is defined on a given scorecard, the minimum achievement for each individual metric will be 0% and the maximum achievement will be 200%.

5.2 Target Adjustment Mechanism

Enbridge Gas was directed through the OEB's Decision on the 2015-2020 DSM Plans[23] to apply a Target Adjustment Mechanism ("TAM") to establish subsequent targets for scorecard metrics based a previous year's audited metric achievement and spend. Enbridge Gas will continue to employ a TAM to establish metric targets for years subsequent to the metric targets approved for the first year of a multi-year plan.

The formula for the TAM is:

Year 2 100% Metric Target =

(Year 1 Performance[(i)] ÷ Year 1 Spend[(ii)]) x Year 2 Budget[(iii)] x (productivity factor x inflation adjustment

(i) Performance is the audited metric achievement in the given year. For natural gas savings (m^3) metrics, the formula utilizes the LRAM natural gas savings achievement that calculates savings using best-available assumptions.
(ii) Spend is the spend attributable to the respective metric excluding overheads.
(iii) Budget is the approved next year budget (escalated for inflation) attributable to the respective metric excluding overheads.

A productivity factor of 2% will factor into TAM in the continued pursuit of efficiencies.

An inflation adjustment will recognize that the value of incentives and other program costs should be stated in real terms.

By way of illustration: if the utility's 2022 verified net annual gas savings achievement for a given metric is 15 million m^3 with an audited spend of

---

[23] EB-2015-0029 / EB-2015-0049, OEB Decision and Order (January 20, 2016), p. 68.

$7.50million. (excluding overheads), this can be expressed as 2.00 m³ per dollar spent.

To calculate the 2023 metric target:

the 2022 outcome:		*2.00 m^3/$*	*multiplied by*
the 2023 budget:	*x*	*$7,700,000*	
which equals:	*=*	*15,400,000 m^3, multiplied by*	
2% productivity factor	*x*	*1.02*	
adjustment for inflation	*÷*	*1.02*	
resulting in 2023 100% metric target of		*15,400,000 m^3*	

The lower and upper bands are calculated by multiplying the 100% target by 50% and 150% respectively.

In the illustration the lower band will be 7.7 million m^3 (50% of 15.4 million m^3) and the upper band will be 23.1 million m^3 (150% of 15.4 million m^3).

5.3 Multi-Year Gas Savings Target

In addition to DSM targets as described above, Enbridge Gas will propose a multi-year target in response to the December 1, 2020 letter in which the "OEB encourages Enbridge Gas to develop a longer term natural gas savings reduction target, separate from the annual targets, that it will work to achieve by the end of the next multi-year DSM term."[24]

6. Shareholder Incentive

To effectively encourage the gas utility to pursue DSM, shareholder incentives are intended to motivate the gas utility to both actively and efficiently pursue DSM savings and to recognize performance.

In the 2015-2020 DSM Framework (and rolled over into the 2021 DSM Plan), the OEB directed that a shareholder incentive equal to an annual maximum of $10.45 million

[24] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

would be available to each of EGD and Union.[25] The OEB maintained in its December 1, 2020 letter (EB-2019-0003) that "the OEB is generally supportive of continuing the use of a utility shareholder incentive as a reward for meeting or exceeding performance targets."[26]

For 2022, the proposed maximum shareholder achievable for Enbridge Gas should be consistent with the total amount approved by the OEB for the two legacy utilities in the prior 2015-2020 framework. This annual maximum shareholder incentive totals $20.9 million. Subsequently, just as the DSM budget will be increased for inflation, this maximum incentive should be increased annually for inflation over the course of the next multi-year plan.

In response to feedback from a number of interested parties through the Post-2021 Framework consultation, the application of the proposed shareholder incentive is being revised to focus efforts on a number of distinct but important objectives which are intended to not only motivate Enbridge Gas to continue to strive to meet or exceed scorecard targets, but also to manage the DSM Plan to increase focus on cost-effectiveness and maximize net benefits.

Enbridge Gas will propose an allocation of the maximum performance incentive amount in line with the achievement of a combination of distinct performance incentive structures as part of its multi-year DSM plan application for the OEB to review.

7. DSM Plan and Program Considerations

The OEB's December 1, 2020 letter provides the following guidance with regard to designing the next multi-year DSM Plan:

> The OEB expects Enbridge Gas to seek out elements of current programs that can be modified and consider new programs in order to optimize

[25] EB-2014-0134, OEB Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 22.
[26] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

> overall program results to make the best use of ratepayer funding. When reviewing its current suite of programs and potential future programs, Enbridge Gas is expected to consider input received through the post-2020 DSM framework consultation, lessons learned from the past six years of activity, the OEB's evaluation reports and recommendations from the Evaluation Contractor, stakeholder feedback from the Mid-Term Review consultation and the recent 2021 DSM plan proceeding, the 2019 Achievable Potential Study, as well as the Government's Environment Plan as it continues to evolve.[27]

Enbridge Gas's multi-year DSM plan should focus on addressing the objectives and guiding principles outlined in Section 2 and 3. Ultimately, Enbridge Gas has flexibility in deciding what programs to include in its proposed multi-year DSM plan to ensure it is cost-effective and will enable the achievement of significant benefits, particularly long-term natural gas savings. Where fuel switching away from natural gas aligns with the OEB's stated DSM objectives Enbridge Gas may pursue these activities.

Consistent with OEB direction in the 2015-2020 DSM framework, to help ensure that an appropriate balance among the guiding principles are maintained and that changes to the DSM plan are consistent with the other elements of the DSM framework, Enbridge Gas should apply to the OEB for approval if they decide to re-allocate funds from programs that have been approved as part of the multi-year DSM Plan application to new programs that are not part of their OEB-approved DSM Plan. However, if Enbridge Gas decides to re-allocate funds amongst existing, approved DSM programs, Enbridge Gas should inform the OEB, as well as stakeholders, in the event that cumulative fund transfers among OEB approved DSM programs exceed 30% of the approved annual DSM budget for an individual DSM program (either the program the funds are being transferred from, or the program the funds are being transferred to). This level of guidance is meant to ensure that adequate flexibility in DSM program and portfolio design is maintained, while recognizing that Enbridge Gas is ultimately responsible and accountable for its actions. This flexibility should ensure that Enbridge Gas can appropriately react to and adapt with current and anticipated market developments.

[27] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.

7.1 Program Types

Resource Acquisition programs are programs that seek to achieve direct, measurable savings customer-by-customer and often involve the installation of energy efficient equipment or may involve the adoption of more energy efficient operations or the implementation of process improvement(s) to optimize energy use.

Market Transformation[28] programs are focused on helping to facilitate fundamental changes that lead to greater market adoption of energy-efficient products and services. These programs should also focus on influencing consumer behaviour and attitudes that support reduction in natural gas consumption. They are designed to make a permanent change in the marketplace over a long period of time. These programs include a wide variety of different approaches.

Market transformation programs can be applicable to lost opportunity markets where, for example, equipment is being replaced or new buildings are being built. Lost opportunity markets refer to DSM opportunities that, if not undertaken during the current planning period, will no longer be available or will be substantially more expensive to implement in a subsequent planning period. An example of preventing a lost DSM opportunity would be improving the thermal envelope of a building at the time the building is undergoing unrelated major renovation work.

Some programs are a mix of market transformation and resource acquisition programs and seek both fundamental changes in markets and direct, measurable energy savings.

Market transformation programs operate where competitive forces are not expected to yield the results sought or not within an acceptable timeline. Enbridge Gas can help fill in some of the gaps in achieving market transformation results or accelerate the achievement of those results.

[28] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 13.

Market transformation programs are not amenable to a mechanistic cost-effective screening approach and should be reviewed on a case-by-case basis instead.

7.2. Low Income Program[29]

The purpose of DSM programs tailored to lower income consumers is to recognize that these programs more adequately address the unique challenges involved in providing DSM programs for, and the special needs of, this customer segment. The Low Income program is a set of program offerings designed for low income residents of both single and multi-residential housing which may include resource acquisition or market transformation type offers. Hence, the distinctive features of these types of offerings result from additional guiding principles and design characteristics, as opposed to the nature of the program.

This programming is critical in helping the most vulnerable customers manage their natural gas bills. A list of program requirements, specific to the challenges and needs of this segment has been included to assist in the development of Low Income programming.[30] Consistent with the precedent that was set with the Board approved 2012-2014 Multi-year DSM Plan and associated Settlement Agreement for Enbridge Gas Distribution, "parties agree that free ridership for all low-income measures both prescriptive and custom shall be set at zero."[31] This direction will be consistent franchise-wide for all Enbridge Gas low income programming.

---

[29] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 8.

[30] This criteria has evolved from prior frameworks and was originally developed by the OEB with input from a low income working group. It remains relevant as a key reference and guidepost for DSM income qualified programming.

[31] EB-2012-0394, Enbridge Gas Distribution Inc. Update to the 2012 to 2014 DSM Plan, Settlement Agreement (February 28, 2013) at Exhibit B, Tab 2, Schedule 9, p. 9.

Low Income Program Considerations[32]

In addition to general requirements of DSM programming, income qualified natural gas DSM programs, accessible to low income natural gas consumers, should include the following features:

- Be accessible province wide where gas is available;
- Be available for both single and multi-residential buildings, both social housing and privately owned, including the private rental market;
- Require no, or low, upfront costs to the income qualified energy consumer
- Address non-financial barriers (e.g. communication, cultural, linguistic).
- Be delivered in a cost-effective manner
    - While the Low Income program may not have a positive total resource cost test result, it is still important for Enbridge Gas to be efficient in managing costs to achieve the maximum results for the budget
- Provide a simple, non-duplicative, integrated and coordinated application, screening and intake process for the Low Income program that covers all the segments of the low income housing market including, for example, homeowners, owners and occupants of social and assisted housing, and owners of privately owned buildings that have low income residents.
    - Enbridge Gas will develop specific criteria for determining eligibility criteria.
- Provide integrated, coordinated delivery, wherever possible, with CDM programs; provincial and municipal agencies; social service agencies and agencies concerned with health and safety issues;
    - Encourage collaboration with partners such a private, public and not-for-profit organizations for program delivery
- Include direct install elements:

[32] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 9.

  - Provide a turnkey solution where appropriate from the perspective of the participant such that the participant deals with one entity which coordinates all elements of delivery;
  - Capture potential lost opportunities for energy savings, including new construction of low income/affordable housing.
- Provide an education and training strategy that:
  - Encourages behaviour change of program participants;
  - Helps low income energy consumers help themselves; and
  - Helps program participants to understand the benefits of participating in the income-qualified DSM program and conservation, in general.
- Help channel partners attain necessary skills.

<u>Income Eligibility</u>

Thresholds and approaches for establishing income eligibility criteria for low income programming should be periodically examined to ensure programming is being delivered to the intended population. Most recently, in its December 1, 2020 letter, the OEB instructed that “Enbridge Gas will endeavor to coordinate the delivery of DSM programs with electricity CDM programs where possible, including modifying the participant eligibility requirements of its current low income program in order to be consistent with the electricity income-tested CDM program eligibility requirements.”[33]

Consistent with the direction given by the OEB and to facilitate coordination between low income electricity CDM and natural gas DSM programming, similar income eligibility criteria was adopted by Enbridge Gas as was updated in late 2020 by the IESO.

Specific details regarding income screening and Low Income Program eligibility will be detailed in Enbridge Gas’s multi-year DSM Plan and revisited as appropriate to ensure it remains effective.

---

[33] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.

7.3 Pilot and Test Programs[34]

In addition to delivering established program offerings to its customers, Enbridge Gas should consider how pilot programs and tests can help to better understand new program designs and delivery concepts, leading to greater natural gas savings and market penetration of programs. Pilot programs should involve the testing or evaluation of energy efficient technologies or detailed, customer-specific natural gas usage information that may serve as the model for DSM program development. With a multi-year DSM planning cycle, a forward-looking focus is prudent.

The following guidance from the OEB's Decision on the 2015-2020 DSM Plans remains relevant:[35]

Pilot programs are new initiatives with uncertain outcomes. Pilots allow risks to be taken to try something new in a controlled manner to gauge how the market reacts. Successful pilot programs should be graduated using the pilot results to develop the roll-out. Unsuccessful pilots are learning opportunities. Active prioritization should be applied to identify the best potential pilots with the most potential for success.

Tests are marginal changes to an existing program. Tests may be changes to targeting, program criteria or incentive levels. Tests allow changes to be made without compromising or adding significant risk to the underlying program. The OEB encourages employing tests to actively pursue continuous improvement for established programs. If designed and tracked appropriately, test and control groups would provide the data required to make informed roll-out decisions based on revised targets, TRC-plus ratios, and incentives.

---

[34] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 7.
[35] EB-2015-0029 / EB-2015-0049, OEB Decision and Order (January 20, 2016), p. 53.

Pilots and tests could be included within Resource Acquisition and Market Transformation programs and are necessary to evolve the current portfolio of DSM programs. This year's pilots and tests may be next year's programs.

7.4 Coordination of Natural Gas DSM And Electricity CDM Programs

As communicated in the OEB's December 1, 2020 letter, "consistent with the Ministerial Directive issued to the Independent Electricity System Operator (IESO) on September 30, 2020,[36] the OEB expects that Enbridge Gas will endeavor to coordinate the delivery of DSM programs with electricity CDM programs where possible, including modifying the participant eligibility requirements of its current low-income program in order to be consistent with the electricity income-tested CDM program eligibility requirements. The centralization of electricity CDM programs under the IESO may lead to new opportunities for DSM-CDM collaboration and a greater level of overall energy savings. The OEB expects Enbridge Gas to file evidence addressing linkages to the new electricity CDM framework and to identify opportunities for efficiencies, program cost reductions, and increased natural gas savings."[37]

7.5 Attribution[38]

Attribution relates to whether the effects observed after the implementation of a natural gas utility's DSM activity can be attributed to that activity, or at least partly results from the activities of others. Given the potential for coordination of natural gas DSM programs with electricity CDM programs, the guidance on attribution is divided into two categories: attribution between Enbridge Gas and the IESO (including electric Local Distribution Companies ("LDC"s)), and attribution between Enbridge Gas and other

---

[36] Ministerial Directive issued by the Minister of Energy, Northern Development and Mines, September 30, 2020 to the IESO included the following "To the degree reasonably practicable, the IESO will coordinate the delivery of the CDM programs with entities delivering natural gas Demand Side Management programs."
[37] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.
[38] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 21.

parties (e.g., non- rate-regulated entities such as agencies and various levels of government, non-rate regulated private companies, etc.).

Attribution of Benefits Between Enbridge Gas and the IESO or LDCs

For electricity CDM and natural gas DSM programs jointly delivered with IESO (or in coordination with an LDC), all the natural gas savings should be attributed to Enbridge Gas and vice versa for electricity savings. This represents a continuation of the simplified approach adopted in the 2006 Generic Proceeding and continued through to the 2015-2020 DSM Guidelines.

Attribution of Benefits Between Enbridge Gas and Other Parties

Attribution of savings between Enbridge Gas and other parties (e.g., governments, non-rate-regulated private sector, etc.) should be based primarily on the shares established in a partnership agreement reached prior to the program's launch.

Where Enbridge Gas's allocated share of natural gas savings in the partnership agreement is more than 20% of the share that would have been allocated based on a "percentage of total dollars spent" basis, an explanation for the difference should be provided.[39] In this case, Enbridge Gas is also expected to file anticipated spending in the delivery of the program before the program is launched and the actual amount spent within each program year that has taken place. As partnerships do not always evolve as originally planned, this additional information will help the Board and stakeholders to assess the reasonableness of the shares allocated in the partnership agreement reached prior to the program's launch and the actual contribution Enbridge Gas made to the program.

---

[39] For example, if the partnership agreement allocates a share of 50% of the natural gas savings to the gas utility, but the actual share of "dollars spent" by the utility is 30% or less, an explanation should be provided to justify why the 50% share is more reflective of the gas utility's actual contribution.

The share allocated to Enbridge Gas will be used to determine the credited achievement for each of the relevant metrics used to evaluate the program.

7.6 Energy Efficiency and Integrated Resource Planning

In its December 1, 2020 letter, the OEB listed the following secondary objective for Enbridge Gas's future ratepayer-funded DSM plan: "Create opportunities to defer and/or avoid future natural gas infrastructure projects."[40] The OEB also included the following footnote to this objective:

> DSM can avoid or defer infrastructure passively (by reducing overall natural gas use and infrastructure needs) or actively (by targeting specific infrastructure projects). The OEB has an ongoing hearing that is considering Enbridge Gas's proposed Integrated Resource Planning framework (EB-2020-0091). As part of that proceeding, the OEB will decide on the relationship between the IRP framework and future utility DSM plans and the extent to which Enbridge Gas will be expected to meet this secondary objective as part of its future DSM plan.[41]

Enbridge Gas will consider the direction provided by the OEB in the context of DSM delivery, once that proceeding has concluded.

8. Program Evaluation

Evaluation, Measurement and Verification ("EM&V") is the process of assessing the impacts and effectiveness of a DSM program on its participants and/or the market. Moreover, EM&V of DSM activities is important to support the OEB's review and approval of prudent DSM spending, and requests to recover lost revenues and shareholder incentive amounts claimed by Enbridge Gas. This overview is adapted from the OEB's August 21, 2015 memo (EB-2015-0245). As was initiated in the 2015-2020 Framework, the OEB assumed the coordination function of the EM&V process, outlined

40 EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
41 Ibid, p. 3.

a DSM Evaluation Governance Structure, and established the Evaluation Advisory Committee ("EAC").

As communicated in its December 1, 2020 letter, "the OEB will continue to provide annual oversight of DSM programs through its role in leading the evaluation, measurement, and verification (EM&V) activities."[42]

Six general EM&V activities are defined below, along with the accountability of such activities.

- Gross Measurement
- Draft and Final DSM Annual Reports
- Evaluation, Measurement & Verification (EM&V) Plan
- Impact Evaluation and Annual Verification of DSM Results
- Technical Resource Manual ("TRM") updates
- Process Evaluation

8.1 Gross Measurement

Description: The method(s) used by the program administrator (Enbridge Gas) to determine the gross resource savings claimed by a DSM program offering. *Examples: Prescribed savings (as per TRM), and custom project modeling tools.*

Accountability: Enbridge Gas

Gross measurement approaches are a component of program design and delivery, which continue to be Enbridge Gas's accountability. Each DSM program offering proposed in the Multi-Year DSM Plan includes an approach to gross measurement.

It is critical that gross measurement approaches are determined and approved for each program offering at the beginning of the DSM Multi-Year Plan term, as they directly

[42] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

impact how the program offerings are delivered, and how DSM budgets and targets are set. Any impact evaluation undertaken should align with the gross measurement approach. Should a fundamental change to gross measurement approaches be recommended by Enbridge Gas (for example, to account for new/innovative ways of determining savings and delivering program offerings) Enbridge Gas will file a letter to the OEB advising of such change.

8.2 Draft and Final DSM Annual Reports

Description: Annual reporting of DSM activities and results.

Accountability: Enbridge Gas

Consistent with the 2015-2020 DSM Framework, Enbridge Gas will continue to provide a Draft DSM Annual Report (previously referred to as the Draft Evaluation Report) to OEB Staff by April 1st of the year following the DSM program year being reported on.[43] The Draft DSM Annual Report supports and informs the Evaluation Contractor (EC) in carrying out the evaluation and audit process of Enbridge Gas's DSM plan.

Enbridge Gas's Final DSM Annual Report will be filed following the conclusion of the annual DSM audit, as part of Enbridge Gas's DSM Deferral and Variance Account Disposition application for the applicable program year.

8.2.1 Components of the DSM Annual Report

The DSM Annual Report will be used to inform the OEB on Enbridge Gas's year-over-year progress in the implementation of its multi-year DSM Plan by summarizing the

---

[43] Enbridge Gas's Draft DSM Annual Report requires finalized information from the previous year's DSM annual audit (for example, for target setting). Should a previous year's DSM annual audit not be concluded by March 1st (one month ahead of the April 1st submission date for the Draft DSM Annual Report), Enbridge Gas will propose an alternative approach and/or timeline to OEB Staff.

savings achieved, budget spent and the process evaluations conducted by the utility in support of the draft results.

The DSM Annual Report should provide an overview of the DSM program results including the annual resource savings attributable to each program, presented as both net and gross of the adjustment factors. Enbridge Gas should include, as an appendix to their DSM Annual Report, any evaluation studies provided by third party evaluators, and any other relevant research.

Enbridge Gas should provide a statement that outlines the program year's:

- Gross and Net annual natural gas savings;
- Net benefits;
- Cost Effectiveness;
- Lost revenue amounts;
- Shareholder incentive amounts;
- Budget; and
- Actual spend.

Enbridge Gas should also indicate in their DSM annual report:

- Offering changes that occurred during the program year;
- Lessons learned over the course of the program year; and,
- Any planned activities or anticipated offering changes for the subsequent program year, if applicable.

At a minimum, the DSM annual report should include the following key elements, in a clear and concise manner, at the beginning of the report:

- Annual and long-term DSM budgets ($/year, and $/plan term);
- Actual annual total DSM costs (including total DSM spend, shareholder incentive, and lost revenues) for each rate class dating back 10 years;

- Historic actual annual DSM spending ($/year) dating back 10 years;
- Historic annual shareholder incentive amounts available and earned ($/year) dating back 10 years;
- Shareholder incentive earned as a percent (%) of DSM spend; and
- Total historic annual and cumulative gross and net natural gas savings (m^3) dating back 10 years.

8.3 Evaluation, Measurement &Verification (EM&V) Plan

Description: Description of planned impact evaluation and verification, and process evaluation activities to be undertaken during the Multi-Year Plan. The purpose of the EM&V Plan is to outline the planned EM&V activities and their objectives.

Accountability: The OEB will retain a third-party Evaluation Contractor to draft an EM&V Plan with advice and input from the EAC. In addition, the OEB expects that all process evaluations undertaken by Enbridge Gas will be included in the OEB's EM&V Plan.[44]

8.4 Impact Evaluation and Annual Verification of DSM Results

Description: Post-implementation assessment and evaluation of the results of DSM program offerings. *Examples: Net-to-Gross evaluation, Custom Project Savings verification, Installation verification.*

Accountability: Coordinated by OEB, the EC will be responsible for auditing annual DSM results based on the EM&V Plan and producing a Final Evaluation and Audit Report.

Consistent with the 2015-2020 DSM Framework, the OEB will continue to coordinate impact evaluation and annual verification activities with input from the EAC. The OEB will be responsible for selecting a third-party Evaluation Contractor (EC) who is responsible to carry out the evaluation and audit process of Enbridge Gas's DSM

[44] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

program offerings. The OEB will strive to have an EC hired by October 1st for the year to be audited. The EC will conduct their work and issue recommendations and proposed revisions for comment to the EAC and Enbridge Gas prior to the EC finalizing the Audit and Evaluation Report. Furthermore, the scope and deliverables of any specific impact evaluation and verification activities should include input from the EAC and Enbridge Gas.

8.5 Technical Resource Manual ("TRM") updates

Description: Updates to input assumptions for existing prescriptive DSM measures, and addition of new prescriptive DSM measures

Accountability: Coordinated by the OEB

Consistent with the 2015-2020 DSM Framework, the OEB will continue to coordinate TRM updates with input from Enbridge Gas and the EAC. The currently established TRM process as described in the EC's November 2, 2017 document (Technical Reference Manual Maintenance and Update Process) should continue, with updates made as needed.

8.6 Process Evaluation

Description: Ongoing assessment of the effectiveness of DSM offerings (generally qualitative).

Examples: Assessing the effectiveness of specific program design elements from the customer's perspective, etc.

Accountability: Enbridge Gas

Process evaluation is directly related to program design and implementation. Coordination of process evaluations, including which programs to evaluate and when, selection of any third parties engaged for this work, and proposed scopes of work and methodologies, continue to be Enbridge Gas's accountability. Enbridge Gas will provide a formal process evaluation plan to the EC and EAC for inclusion in the EC's EM&V Plan. Furthermore, the scope and deliverables of any specific process evaluation activities will be presented to the EC and EAC for comment.

8.7 Evaluation Governance Terms of Reference ("ToR")

While the six main EM&V activities and their accountabilities are outlined above, multiple stakeholders are involved in these activities as part of the DSM evaluation governance process.

In order to ensure clear accountabilities and responsibilities, Enbridge Gas has developed an Evaluation Governance Terms of Reference ("ToR") with input from OEB Staff and other current EAC members (see Appendix 1). Enbridge Gas submits that an Evaluation Governance ToR should be a requirement of the OEB and be maintained and updated as necessary. An established Evaluation Governance ToR will ensure:

- Effective outcomes of the evaluation governance process, by ensuring roles, accountabilities and critical processes are established and clarified in advance, rather than being managed in-year on a case-by-case basis.

- Clarity and consistency when stakeholder members change. Changes can include new EC's, OEB Staff, Enbridge Gas staff, non-utility stakeholders, and/or independent experts. This clarity and consistency support efficient use of DSM evaluation resources, resulting in efficient use of ratepayer funds.

- Reduced disputes between stakeholders during the DSM annual audit process and Enbridge Gas's DSM Deferral and Variance Account Disposition application proceedings, by ensuring all stakeholders have clear and consistent understanding of the stakeholder process.

9. Input Assumptions and Adjustment Factors

Enbridge Gas relies on a series of input assumptions and adjustment factors to estimate energy savings, as well as calculate shareholder incentive, lost revenues, and cost effectiveness achieved through the design and implementation of DSM program offerings.

9.1 Input Assumptions

Various assumptions are used at different stages of a multi-year DSM Plan. Assumptions such as operating characteristics and associated units of resource savings for a list of DSM technologies and measures are referred to as "input assumptions".

For each applicable DSM measure, the following input assumptions are considered:

- Natural gas savings
- Electricity impacts
- Water impacts
- Estimated useful life
- Equipment cost

Input assumptions for applicable DSM measures are defined relative to a frame of reference ("base case" or "baseline") which represents either the existing condition, the code compliant requirement, or the standard practice. Specifying input assumptions relative to a frame of reference can be characterized by four general decision types:[45]

- Early Replacement: a measure category where a utility energy efficiency program has caused a customer to replace operable equipment with a higher

[45] 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

efficiency alternative (also referred to as advancement). *Example: An operating unit heater is replaced with a more efficient radiant heater.*

- Natural Replacement: a measure category where the equipment is replaced on failure or where a utility energy efficiency program has not influenced the customer decision to replace but once the decision has been made, the utility program influences a higher efficiency alternative. *Example: An operational gas water heater is replaced because of visible rust, and a more efficient water heater, promoted by the program, is installed.*

- New Construction: efficiency measures in new construction or major renovations, whose baseline would be the relevant code or standard market practice. *Example: A project design team, influenced by the program, specifies a high efficiency boiler rather than the least cost code compliant, or predominant industry practice, option.*

- Retrofit: a measure category that includes the addition of an efficiency measure to an existing facility such as insulation or air sealing to control air leakage. *Example: An ozone treatment system is added to an existing commercial laundry system in order to facilitate using lower water temperatures.*

9.2 Adjustment Factors

To ensure that the energy savings claimed from DSM program offerings reflect those which Enbridge Gas directly influenced and are appropriately captured, adjustments can be made to gross savings. Adjustment factors may be applied to measures, and can include:

- Net-to-gross adjustments, to account for free ridership and spillover.

- Verification adjustments, to account for verified implementation and persistence of measures, and verified savings claims.

9.2.1 Net-to-Gross Adjustments

Free ridership refers to savings claimed through a DSM program offering which would have occurred without intervention from the utility. In contrast, spillover refers to savings influenced by a utility's program-related information and marketing efforts but are not actually captured in the program. Net-to-gross adjustments reflect the program's savings ratio after consideration of free ridership and spillover effects (ex. Net-to-gross adjustment = 1 – free ridership adjustment + spillover adjustment).

Net-to-gross adjustments should be assessed for reasonableness prior to the implementation of the Multi-Year Plan and annually thereafter, as part of the ongoing impact evaluation and audit process. Both components of net-to-gross adjustments (i.e. free ridership and spillover) are equally important to understanding the actual impacts of a DSM program, in order to assess the value a DSM program offering provides to customers. Any NTG assessment should include measurement of both free ridership and spillover.

9.2.2 Verification Adjustments

Verification adjustments reflect post-implementation assessments that have been conducted to verify actual installation of measures, as well as validate the calculations and inputs used to estimate savings claims.

- Installation and persistence: For some program offerings, it may be prudent to assess whether the measures claimed were in fact installed and remained installed at the time of the annual audit process. For example, if a mass-market utility program offering involved the distribution of 10,000 thermostats, it may be prudent to understand how many of those thermostats were in fact installed and remained installed. If it is found that 5% of the measures were not installed, a 95% adjustment factor should be applied to the program's results.

- Savings claims: For programs where the utility collects site-specific inputs to develop a savings claim for the project, it may be prudent to conduct a post-implementation savings verification study to assess the reasonableness of those inputs. For example, if a custom project utilized a site-specific temperature input that was found to be inconsistent, and resulted in a 5% over-estimation of savings, a 95% adjustment factor would be applied to the project's results.

9.3 Changes to Input Assumptions and Adjustment Factors (Shareholder Incentive and Cost-Effectiveness)

When input assumptions and adjustment factors are changed or updated, clear guidelines are needed to ensure the application of those changes (prospective vs. retroactive) are consistent and appropriate. The following paragraphs outline how changes to input assumptions and adjustment factors are applied.

Retroactive changes are applied to the results of the program year being evaluated. Targets for the program year being evaluated will remain unchanged, while the change will be applied to the following program year's targets. For example, if a change is finalized by the Evaluation Contractor in mid-2022 as part of the evaluation of the 2021 program year, the change will be applied to the results of the 2021 program year. The 2021 program year targets will remain unchanged, while the change will be applied to the 2022 program year targets.

Retroactive changes are appropriate for factors that were directly within the utility's influence during the program year being evaluated. Specifically, any change to project-specific input assumptions are applied retroactively since those changes were developed by the utility during the program year in question. Additionally, any changes to NTG adjustments for offerings with one-to-one implementation approaches are applied retroactively since the utility had direct control of in-year application approvals for the offering.

Verification adjustments are retroactively applied for all situations, assuming the verification methodology aligns with the program offering's OEB-approved gross measurement methodology.

Any changes to project-specific input assumptions resulting from changes to codes and standards will be included in both results and targets. This ensures targets are not inappropriately set based on outdated codes and standards. For example, if a code change comes into effect during the 2023 program year, the 2023 program year results and targets will be adjusted to account for the change to codes and standards.

Prospective changes are applied to the results and targets of the year following the year the change is finalized by the Evaluation Contractor. For example, if a change or update is finalized by the Evaluation Contractor in mid-2022, regardless of the year being evaluated, the change will come into effect as of 2023 for results and targets.

Prospective changes are appropriate for changes outside of the utility's direct influence during the program year. Any change to prescribed input assumptions are applied prospectively, since those changes are not controlled by the utility. Once the changes are known to the utility, the utility can plan accordingly and adjust as necessary for the following program year. Additionally, any changes to NTG adjustments for offerings with mass-market implementation approaches are applied prospectively since the utility cannot control individual in-year application approvals for the offering. Once a new NTG adjustment is known, the utility can adjust program parameters based on that information for the following program year.

Any changes to prescribed input assumptions (ex. TRM) caused by changes to codes and standards will follow the regular update process and policy for prescriptive input assumptions (i.e. applied to results and targets as of the year following the year the change is finalized by the Evaluation Contractor).

Table 1 provides a summary of when updates are treated as retroactive vs. prospective.

Table 1: Retroactive vs. Prospective Application of Input Assumptions and Adjustment Factors to Results *

	Input Assumptions	**Adjustment Factors**	
		NTG Adjustments	**Verification Adjustments**
Retroactive	Changes to project-specific input assumptions (ex. unique savings calculations determined by the utility) **	Changes to NTG for offerings with one-to-one implementation approaches (ex. Offerings where the utility has the ability to approve/reject individual projects in-year on a case-by-case basis).	All adjustments
Prospective	Changes to prescribed input assumptions (ex. TRM or Custom Measure Life Table)	Changes to NTG for offerings with mass-market implementation approaches (ex. Offerings where projects are approved/rejected based on established program screening parameters, rather than by the utility on a case-by-case basis)	N/A

* Retroactive changes are applied to results of the program year being evaluated. Targets for the program year being evaluated will remain unchanged, while the change will be applied to the following program year's targets. Prospective changes are applied to results and targets of the year following the year the change is finalized by the Evaluation Contractor.

** Code changes as outlined in the paragraph above would adjust targets in the same year in which they come into effect.

9.4 Changes to Input Assumptions and Adjustment Factors (LRAM)

The OEB has determined that lost revenues related to reductions in customer gas consumption as a result of DSM programming should not be a disincentive to delivering DSM programs. As such, the OEB established a Lost Revenue Adjustment Mechanism (LRAM). For the purposes of determining LRAM amounts, all input assumptions and adjustment factor changes will be applied retroactively to the year being evaluated, regardless of the approach used for the purposes of determining shareholder incentive amounts and cost-effectiveness described in Section 9.3.

In other words, the evaluation of the achieved results for the purpose of determining the lost revenue adjustment mechanism (“LRAM”) amounts should be based on the best available information which, in this case, refers to the updated input assumptions and adjustment factors resulting from the evaluation and audit process of the same program year.

9.5 New Input Assumptions for Prescriptive Measures

Enbridge Gas regularly conducts research to develop input assumptions for new prescriptive measures. Since the formal TRM update process and timelines are coordinated by the OEB (see Section 8.6), a significant gap can occur between the completion of Enbridge Gas’s new measure research and its formalization within the OEB’s TRM.

In order to allow for timely introduction of new prescriptive measures to customers, the currently established TRM process as described in the EC’s November 2, 2017 document (Technical Reference Manual Maintenance and Update Process) should continue, with updates made as needed.

10. Cost-Effectiveness Screening

As specified in the OEB's December 1, 2020 letter, "the OEB expects that all programs continue to be cost-effective as defined in the Mid-Term Review Report."[46]

Enbridge Gas should screen DSM programs using the Total Resource Cost-Plus ("TRC-Plus") test. The TRC-Plus test measures the benefits and costs of DSM programs for as long as those benefits and costs persist. Under this test, benefits are driven by avoided resource costs, which are based on the marginal costs avoided by not producing and delivering the next unit of natural gas to the customer. Those marginal costs avoided include the natural gas commodity costs (both system and customer) and transmission and distribution system costs (e.g., pipes, storage, etc.). The marginal costs also include the benefits of other resources saved through the DSM program, such as electricity, water, propane, and heating fuel oil, as applicable.[47] A 15% non-energy benefits adder is applied to each of these avoided resource costs. The TRC-Plus test also includes benefits driven by reductions in carbon emissions saved through the DSM program. The 15% non-energy benefits adder is not applied to carbon benefits. TRC Plus calculations are detailed in Section 10.3 below.

Enbridge Gas should include the cost of carbon as part of avoided costs.[48]

For a program to be deemed cost-effective, it must achieve a screening threshold benefit/cost ratio of 1.0 or greater. This shows that the benefits of the program are equal to or greater than the costs of the program. To recognize that the Low Income natural gas DSM program may result in important benefits not captured by the TRC-Plus test, this program should continue to be screened using a lower threshold value of 0.7. Low

---

[46] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.
[47] Consistent with: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014); updated for the inclusion of the cost of carbon.
[48] 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.

Income offerings that fail to meet a TRC-Plus cost-benefit ratio of 0.7 can still be applied for, and approval of these programs will be considered on their merits.[49]

Some programs, such as market transformation and pilot programs are not amenable to a mechanistic screening approach and should be reviewed on a case-by-case basis instead. Among the programs amenable to a mechanistic screening approach, Enbridge Gas is expected to only apply for approval of programs that are cost effective as determined by the particular screening test.[50]

10.1 Net Equipment Costs

Net Equipment Costs relate to the costs of the more efficient equipment relative to the base case scenario. They include capital, installation, and where material, cost of removal less salvage value (e.g., in the case of a replacement), and operating and maintenance ("O&M"). As the TRC-Plus test assesses the benefits and costs of DSM programs from the perspective of the utility and participant, it does not differentiate between who (natural gas utility, customer, or third party) pays the cost of the equipment.

Net Equipment Costs can be either the cost difference between the more efficient equipment and a base measure (or the incremental cost) or the full cost of the more efficient equipment. When the investment decision is a replacement, the Net Equipment Costs will typically be incremental. For example, if a DSM program results in a high efficiency natural gas furnace being purchased instead of a standard model, the Net Equipment Costs would be incremental: they would be the cost differential between the two options. In contrast, retrofit and discretionary investments are typically associated with the full cost of the equipment. For example, if a DSM program results in a retrofit to

---

[49] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 26.
[50] Consistent with: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 25.

improve the energy efficiency of an industrial process and, in the absence of such DSM program, the status quo would have been maintained, then the Net Equipment Costs will be the full cost of the equipment. As these examples illustrate, Net Equipment Costs depend not only on the equipment costs but also on the costs that would have been incurred under the base case (i.e. in the absence of the DSM program).

A third type of equipment cost is the cost of the equipment that is assigned to a project when a replacement decision is done early, or advanced, because of a natural gas utility's DSM programming efforts. Early replacements occur when an older, but still working lower efficiency technology, is replaced with a more efficient piece of equipment. In these cases, Enbridge Gas should adjust both the equipment life and the project cost to reflect the advancement. This adjustment is akin to a net present value estimate.

O&M costs associated with the more efficient equipment are often not incremental (i.e., they would have been incurred under the base case anyway). However, there are some exceptions where the incremental O&M costs are significant, and these should be appropriately accounted for in the Net Equipment Costs. As a general rule, cost differential from the base case should be considered as part of the Net Equipment Costs for as long as they persist.

Free ridership and spillover effects, if applicable, should also be taken into account when calculating the Net Equipment Costs. A free rider is a "program participant who would have installed a measure on his or her own initiative even without the program."[51] In contrast, spillover effects refer to customers that adopt energy efficiency measures because they are influenced by a utility's program-related information and marketing efforts, but do not actually participate in the program. Net Equipment Costs associated

[51] Violette, Daniel M. (1995) *Evaluation, Verification, and Performance Measurement of Energy Efficiency Programs*. Report prepared for the International Energy Agency.

with free riders are excluded from the TRC-Plus test.[52] However, as discussed in Section 10.2, all Program Costs associated with free riders should be included in the TRC analysis.

Spillover effects are essentially the mirror image of free ridership. Net Equipment Costs associated with spillover effects are included in the TRC-Plus test.[53] However, as discussed below in Section 10.2, there are no Program Costs associated with spillover effects.

Information sources for equipment costs vary. For residential equipment, retail store prices are appropriate sources of information for many technologies including appliances and "do-it-yourself" water heater or thermal envelope upgrades. It is common practice to specify an average price based on a sample of retail prices. For utility direct/install programs, it is appropriate to use the cost to the utility of bulk purchase of the equipment. For commercial and industrial equipment, cost data can be more complicated to acquire due to limited access and confidentiality concerns. For larger "custom" projects, invoices or purchase orders may be necessary to support the cost estimate. Net Equipment Cost estimates should be based on the best available information known to Enbridge Gas at the relevant time.

10.2 Program Costs

For the purpose of the TRC-Plus test, the Program Costs related to DSM programs include the following components:

i) Development and Start-up;
ii) Promotion;
iii) Delivery;

[52] Eto, J, (1998) *Guidelines for assessing the Value and Cost-effectiveness of Regional Market Transformation Initiatives*. Northeast Energy Efficiency Partnership, Inc.
[53] Eto, J, (1998) *Guidelines for assessing the Value and Cost-effectiveness of Regional Market Transformation Initiatives*. Northeast Energy Efficiency Partnership, Inc.

iv) Evaluation, Measurement and Verification (“EM&V”) and Monitoring; and
v) Administration.

Of the above costs, only Start-up, Promotion, Delivery, and some Evaluation and Verification are applicable to programs. Other costs related to the design and the delivery of DSM program are appropriately considered at the DSM portfolio level. These include Development, some Evaluation costs, and Monitoring, Tracking and Administration costs. If certain costs are not assigned to an identified program, these costs should be accounted at the portfolio level.

Incentive costs are not included in Program Costs. Incentive costs may include cash incentives, in-kind contributions and/or tax benefits provided to participants to encourage the implementation of a DSM measure. Incentive costs are a transfer from a program-sponsoring organization to participating customers and consequently do not impact the net benefits or costs. As the TRC-Plus test assesses the benefits and costs of DSM programs, it does not differentiate between who (natural gas utility or third party) pays for the Program Costs. Program Costs components are further explained below.

i) Development and Start-up Costs

A DSM program may involve start-up costs in its early stages. For example, there may be costs incurred to train staff in the use of the DSM program’s equipment or techniques. In general, start-up costs are only a small component of the total costs in the life cycle of a DSM program.

ii) Promotion Costs

Promotion costs may be incurred to educate the customer about a DSM program and will vary by program type and level of promotional effort. The cost of promotion depends on the method employed, the market segment and the DSM measures promoted.

As noted above, incentive costs are not included in Program Costs since they do not impact the net benefit or cost.[54]

iii) Delivery Costs

Delivery costs include any costs related to the implementation of the program, other than utility staff. This includes costs related to specialized software, and monies to third-party delivery agents or business partners.

iv) EM&V and Monitoring Costs

There are two broad categories of evaluation activity: impact evaluation and process evaluation. Impact evaluation focuses on the specific impacts of the program – for example, savings and costs. Process evaluation focuses on the effectiveness of the program design – for example, the delivery channel. Some of these costs will be assigned directly to a specific program or multiple programs, while a portion of the costs are more appropriately assigned across all programs (i.e., at the DSM portfolio level).

EM&V and monitoring costs are incurred for systems, equipment and studies necessary to track measurable levels of program success (e.g., number of participants/installations, natural gas savings, Net Equipment Costs and Program Costs) as well as to evaluate the features driving program success or failure.

v) Administrative Costs

Administrative costs are generally the costs of staff who work on DSM activities. These costs are often differentiated between support and operations staff. Support staff costs are considered fixed costs or “overhead” that occur regardless of the level of customer participation in the programs. Operations staff costs are variable, depending on the level of customer participation. Enbridge Gas should include all staff salaries that are

[54] For clarity, while incentive costs are not included in the TRC-Plus test, incentive costs should be included in and reported as part of the Enbridge Gas’s DSM program budget.

attributable to DSM programs as part of their Program Costs. For practical purposes, if certain administrative costs cannot be reasonably assigned to individual programs these costs should be accounted for at the portfolio level.

Program Costs should be considered as part of the TRC-Plus test for as long as they persist (e.g., monitoring and EM&V costs may be spread over a period of time).

All Program Costs associated with free riders should be included in the TRC-Plus analysis. Programs that have high free ridership rates will be less cost effective (as measured by the TRC-Plus test) since their Program Costs will be included in the analysis while their benefits will not.

The spillover effects are associated with customers that adopt energy efficiency measures because they are influenced by a utility's program-related information and marketing efforts, but do not actually participate in the program. Accordingly, there are no Program Costs associated with the spillover effects.[55] If the spillover effects are considered, then programs that have high spillover rates will be more cost effective (as measured by the TRC-Plus test) since they do not have Program Costs while they generate benefits.

Program Cost estimates should be based on the best available information known to Enbridge Gas at the relevant time.

10.3 TRC-Plus Test Calculation[56]

For screening purposes, the TRC-Plus test should be performed at both the program and portfolio level.

---

[55] An alternative way to explain this is that all Program Costs are allocated to program participants (including free riders) and there are no additional Program Costs generated by the spillover effect.

[56] Adapted from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 31; updated for the inclusion of the cost of carbon.

At the program level, the TRC-Plus test takes into account the following:

- Avoided Costs (including the cost of carbon);
- Net Equipment and Program Costs;
- Adjustments Factors; and,
- A 15% non-energy benefit adder applied to all avoided costs except avoided carbon costs.

The results of the TRC-Plus test can be expressed as a ratio of the present value ("PV") of the benefits to the PV of the costs. For example, the PV of the benefits consists of the sum of the discounted benefits accruing for as long as the DSM program's savings persist. The PV of the benefits therefore expresses the stream of benefits as a single "current year" value.

If the ratio of the PV of benefits to the PV of the costs (the "TRC-Plus ratio") exceeds 1.0, the DSM program is considered cost effective as it implies that the benefits exceed the costs. An alternative way to consider the cost-effectiveness of a program under a TRC-Plus ratio threshold of 1.0 is to determine whether the TRC-Plus net savings (or net benefits) are greater than 0. The TRC-Plus net benefits are equal to the PV of benefits less the PV of costs.

To provide the OEB with an appropriate amount of information regarding cost-effectiveness, all programs should be screened with the TRC-Plus test. The TRC-Plus threshold test should be normally 1.0 for all programs amenable to this screening test, except the Low Income program. The following guidance offered by the OEB and outlined in the previous framework should continue:

> Some programs, although beneficial when reviewed from a broader perspective, may not pass a cost-effectiveness screening threshold of 1.0. The Board will consider these programs on a case-by-case basis. To recognize that all programs may not pass the TRC-Plus test, the utility should ensure its overall DSM portfolio has a TRC-Plus ratio of 1.0 or greater. Further, since low income natural gas DSM programs may result in important benefits not captured by the TRC-Plus test, these programs

should be screened using a lower threshold value of 0.70 instead, but also may be considered at a lower threshold.[57]

The TRC-Plus ratio is expressed mathematically below:

$$TRC\ Plus\ Ratio = \frac{PV_{Benefits}}{PV_{Costs}}$$

Where

$$PV_{Benefits} = \left(\sum_{t=1}^{N} \frac{UAC_t + TC_t}{(1+d)^{t-1}} + \sum_{t=1}^{N} \frac{UAC_{at} + PAC_{at}}{(1+d)^{t-1}}\right) \times (1 + 15\%) + \sum_{t=1}^{N} \frac{UACar_t}{(1+d)^{t-1}}$$

$$PV_{Costs} = \sum_{t=1}^{N} \frac{PRC_t + PCN_t + UIC_t}{(1+d)^{t-1}}$$

And where,

UACt	=	Utility avoided supply costs (gas, water, electricity and other resources as applicable) in year t (see Section 11) Avoided costs should be calculated using the input assumptions, savings estimates, and adjustment factors based on the best available information known to Enbridge Gas at the relevant time, as described in Section 9.1 and 9.2.
UACat	=	Utility avoided supply costs for the alternate fuel in year t
UACart	=	Utility avoided carbon costs in year t (see Section 11)
TCt	=	Tax credits in year t
PACat	=	Participant avoided costs in year t for alternate fuel devices
PRCt	=	Program costs in year t (see Section 10.2) Program Costs should be calculated using cost estimates and adjustment factors based on the best available information known to Enbridge Gas at the relevant time, as further described in Sections 9.2 and10.2.
PCNt	=	Net Participant Costs

[57] EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 32.

UICt	=	Utility increased supply costs in year t Utility supply costs should be calculated using cost estimates and adjustment factors based on the best available information known to Enbridge Gas at the relevant time
N	=	Number of years that the savings are expected to persist or that the incremental costs are expected to be incurred, whichever is greater.
d	=	Discount rate (see Section 11.1)

11. Avoided Costs[58]

Assumptions relating to the benefit of not having to supply an extra unit of natural gas or other resource (e.g., electricity, heating fuel oil, propane, or water) through the delivery of DSM programs are referred to as avoided costs. Avoided costs are required to quantify the benefits for the TRC-plus test.

Avoided costs are long-term estimates forecasted over the lifetime of DSM measures and include:

- Avoided natural gas commodity costs
- Avoided natural gas upstream transportation and third-party services costs
- Avoided natural gas seasonal storage requirement costs.
- Avoided unaccounted for natural gas fuel losses
- Avoided natural gas downstream infrastructure costs [59]
- Avoided costs, other resources (electricity, heating fuel oil, propane, and/or water)
- Avoided carbon costs

[58] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 34.
[59] For DSM this reflects passive avoided distribution costs driven by broad-based DSM programs, rather than active/geo-targeted avoided distribution costs unique to a specific initiative.

11.1 Inflation Rate

In some cases, avoided cost estimates are required to extend beyond their forecasted periods. If necessary, a four-quarter moving inflation rate based on the Gross Domestic Product Implicit Price Index for Final Domestic Demand will be used, based on the most recently available information at the time avoided costs are updated.

11.2 Discount Rate

For the purpose of the cost-effectiveness test (i.e. TRC-Plus), the total avoided costs resulting over the life of the DSM measures need to be discounted to a present value. Consistent with the 2015-2020 DSM Framework, the discount rate used to determine the net present value of avoided costs over the lifetime of DSM measures is 4% (real).

12. Accounting Treatment/Deferral and Variance Accounts: Recovery and Disposition of DSM Amounts[60]

Consistent with past practices, recovery and disposition of DSM related amounts (i.e., DSM Variance Account (“DSMVA”), DSM Incentive Deferral Account (“DSMIDA”), and LRAM Variance Account (“LRAMVA”)) will be filed annually by Enbridge Gas based on the final audited results of its DSM programs in relation to the annual plans targets. The DSM amounts should include program spending, shareholder incentive amounts and lost revenues in relation to the DSM programs delivered. Further, lost revenues will not act as a disincentive to Enbridge Gas’s delivery of DSM programs.

Financial and accounting elements related to Enbridge Gas’s DSM Plans (e.g., budget,, shareholder incentive structure, LRAM, DSMVA) will be established at the outset of a multi-year DSM Plan with the intention of applying the same process throughout the

[60] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 36.

duration of the multi-year DSM Plan. Amounts in all DSM variance or deferral accounts should be recorded on an annual basis.

In line with historical practice, Enbridge Gas should, where appropriate, use a fully allocated costing methodology for all DSM activities. Capital assets (property, plant and equipment) associated with the multi-year DSM Plan will be included in rate base and will be treated in the same manner as distribution assets. DSM expenses incurred should be expensed in the normal course of the gas utility's operations.

Cost allocation in rates should be on the same basis as budgeted DSM spending by customer class. This allocation applies to both direct and indirect DSM program costs.

Enbridge Gas should apply annually for the disposition of any balances in its LRAMVA and DSMVA and, as applicable, apply for the shareholder incentive amount associated with the previous DSM program year and disposition of resulting DSMIDA balance.

This application should include the final results as outlined in the Final Evaluation and Audit Reports, and information setting out the allocation across rate classes of the balances in the LRAMVA, DSMVA and DSMIDA.

12.1 Revenue Allocation[61]

Any net revenues generated by a shareholder incentive for distribution rate-funded DSM should be separate from (i.e., not used to offset) the gas utility’s distribution revenue requirement.

[61] Consistent with: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 37.

12.2 Demand Side Management Variance Account ("DSMVA")[62]

This account should be used to track the variance between actual DSM spending by rate class versus the budgeted amount included in rates by rate class. Enbridge Gas should apply annually for disposition of the balance in its DSMVA, together with carrying charges, after the completion of the annual third-party audit.

The actual amount of the variance versus budget targeted to each customer class will be allocated to that customer class for rate recovery purposes. If spending is less than what was built into rates, ratepayers will be reimbursed for the full amount. If more is spent than was built into rates, Enbridge Gas may be reimbursed up to a maximum of 15% above its DSM budget for the year. All additional funding beyond the annual DSM budget must be utilized on incremental program expenses only (i.e. cannot be used for additional overheads).

The option to spend 15% above the approved annual DSM budget is meant to allow Enbridge Gas to pursue programs which prove to be very successful. Accordingly, Enbridge Gas will be permitted to recover from ratepayers up to 15% above its total annual DSM budget amount recorded in its DSMVA provided that it has achieved its weighted scorecard targets (i.e., 100%) on a pre-audited basis for the program(s) prior to additional spending being made on those programs; and, the DSMVA funds were used to produce results in excess of those targets (i.e., in excess of 100%) on a pre-audited basis.

When applying for disposition of its DSMVA account, Enbridge Gas will have to provide evidence demonstrating the prudence and cost effectiveness of the amounts spent in excess of the approved annual DSM budget. In considering the prudence of any spending in excess of an approved annual budget, the OEB will consider the information available to Enbridge Gas at the time the program was implemented.

---

[62] Updated from: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 38.

12.2.1. Deferred Participant Costs

Some program designs result in future financial commitments related to participants. In some cases, participants will undertake activities that may take several years to complete and therefore requires the Company to make financial commitments beyond the current period. For example, a New Construction program allowing participants up to three years to complete the construction of their project and have the energy performance of the final build validated, prior to payment of their incentives. In this case, the future financial commitments Enbridge Gas would need to account for would be the total of the cost of the incentives and the cost to validate that the participant successfully fulfilled their obligations.

This need to account for future financial commitments was recognized by the OEB in its report at the Mid-Term Review of the 2015-2020 Framework[1], where the decision was to allow Enbridge to use the "DSMVA to track future financial commitments for programs with deferred customer incentives."

Enbridge Gas proposes to utilize the same principal for future financial commitments of both incentive and program costs, or collectively Deferred Participant Costs ("DPC"). The DPCs should be tracked in the DSMVA and should only include directly identifiable costs tied to participant commitments forecast to occur in future period(s) and should not include any internal salary or overhead allocation. The intent would be to hold the funds associated with meeting a future program commitment at the time the participant signs up for the program. It is important that the funds are available for the Company to meet these commitments, especially for payments expected to occur outside of the DSM Plan term.

Enbridge should explicitly identify programs that require DPCs when they request approval for the program.

12.3 LRAM Variance Account ("LRAMVA")[63]

The LRAMVA should be used to track, at the rate class level, the actual impact of DSM activities undertaken by Enbridge Gas from the forecasted impact included in distribution rates. Enbridge Gas may only record an LRAM amount in relation to DSM activities undertaken within its franchise area by itself and/or delivered for the gas utility by a third party under contract.

Enbridge Gas should calculate the full year impact of DSM programs on a monthly basis, based on the volumetric impact of the measures implemented in that month, multiplied by the distribution rate for each of the rate classes in which the volumetric variance occurred.[64] LRAM amounts are only accruable and thus only recorded in the variance account until such time as the OEB sets distribution rates for Enbridge Gas based on a new load forecast.

The LRAM amount is recovered in rates on the same basis as the variances in distribution revenues were experienced at the rate class level. The LRAM therefore results in a true-up for each rate class. Enbridge Gas should apply annually for disposition of the balance in their LRAMVA, together with carrying charges, after the completion of the annual third party audit.

12.4 DSM Incentive Deferral Account ("DSMIDA")[65]

The purpose of the DSMIDA is to record the shareholder incentive amount earned by Enbridge Gas as a result of its DSM programs. This account will come into effect at the

[63] Consistent with: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 38.

[64] Union 2014-2018 IRM (established in EB-2013-0202) states that LRAM is only applicable to the contract rate classes as volume variances for general service rate classes in the Union rate zones are captured in the Normalized Average Consumption ("NAC") deferral account. Similarly, LRAM is only applicable to contract rate classes in the EGD rate zone, as volume variances for general service rate classes are captured in the Average Use True-Up Variance Account ("AUTUVA").

[65] Consistent with: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 39.

beginning of the term of the multi-year DSM Plan. Enbridge Gas should apply annually for disposition of the balance in their DSMIDA, together with carrying charges, after the completion of the annual third party audit.

Shareholder incentive amounts will be available in relation to the verified savings outlined in the Evaluation Contractor's Final Evaluation and Audit Reports (as outlined in Section 8.4). In some instances, for offerings where results span multiple years, results may not be available in the year the program was delivered. For these programs shareholder incentives will be applied for and awarded when the results are finalized and evaluation results become available, if applicable.

Incentive amounts paid to Enbridge Gas should be allocated to rate classes in proportion of the amount actually spent on DSM activities on each rate class.

12.5 DSM Activities Not Funded Through Distribution Rates[66]

Any assets purchased with funds from third parties (i.e. not funded through distribution rates) will not be eligible for inclusion in rate base, nor will there be any distribution rate recovery of ongoing operating costs associated with the asset, or income taxes payable in relation to third-party funded activities. Likewise, DSM expenses funded by third parties should not be included in Enbridge Gas's distribution accounts.

Any third-party funding for DSM activities (as opposed to rate-funded DSM activities) should be classified as Non-Rate Regulated Activities. Consequently, the financial records associated with third-party funding should be separate from those associated with Enbridge Gas's distribution activities.

If Enbridge Gas receives third-party DSM revenues and incurs related DSM expenses and/or capital expenditures, these transactions should be recorded in separate non-

[66] Consistent with: EB-2014-0134, OEB Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 40.

utility distribution accounts. Sub-accounts may be used as appropriate to segregate these DSM activities from other Non-Rate Regulated Activities.

APPENDIX 1

ONTARIO DEMAND SIDE MANAGEMENT
EVALUATION GOVERNANCE TERMS OF REFERENCE

Version 1
May 3, 2021

1.0 Background

Effective evaluation governance is an integral part of the Ontario Energy Board's ("OEB") coordination of Demand Side Management ("DSM") Evaluation, Measurement and Verification ("EM&V") activities in Ontario.

The current evaluation governance format was established by the OEB as part of its 2015-2020 DSM Framework,[1] and continued as part of its post-2020 DSM Framework.[2] The DSM Evaluation Governance Terms of Reference ("DSM EG ToR") provides clarity on the evaluation governance structure, and the roles/accountabilities of the parties engaged in evaluation activities for DSM in Ontario.

2.0 DSM Evaluation Governance Structure and Parties

The OEB's DSM evaluation governance structure consists of:

- OEB
- Evaluation Contractor ("EC")
- Evaluation Advisory Committee ("EAC"), which includes:
    - OEB Staff
    - Enbridge Gas Inc. ("EGI")
    - Non-utility stakeholders
    - Independent experts
    - Observers from the Independent Electricity System Operator ("IESO")

[1] EB-2015-0245, OEB Letter, 2015-2020 DSM Evaluation Process of Program Results, August 21, 2015.
[2] EB-2019-0003, OEB Letter, Post-2020 Natural Gas Demand Side Management Framework, December 1, 2020.

- Observers from the Ontario Ministry of Energy, Northern Development and Mines ("MOE")

The current list of individuals representing each party on the EAC is provided in Appendix A.

The EC is selected by OEB Staff (described in more detail in Section 3.0). The individuals representing non-utility stakeholders and independent experts on the EAC is determined by the OEB and is not within the scope of the DSM EG ToR. Should EAC membership change for non-utility stakeholders and independent experts, the OEB should inform the parties listed above, and an updated DSM EG ToR will be provided within EGI's next DSM Annual Report.

The individuals representing OEB Staff, EGI, the IESO, and the MOE, are determined by the parties themselves.

2.1 EAC Purpose and Scope

The EAC provides input and advice on the evaluation of EGI's DSM programs, including:

- Impact evaluation of EGI's DSM programs, coordinated by OEB Staff;
- Annual verification of EGI's DSM results, coordinated by OEB Staff;
- Updates to the Technical Resource Manual ("TRM"), coordinated by OEB Staff;
- Development of the Ontario Natural Gas DSM EM&V Plan, coordinated by OEB Staff; and,
- Process evaluation of EGI's DSM programs, coordinated by EGI.

EAC members are expected to provide input and advice based on their experience and technical expertise, and not to advocate for the parties they represent.

3.0 DSM Evaluation Governance Roles/Accountabilities

The primary purpose of the evaluation governance structure described in Section 2.0 is to provide the OEB with an independent assessment of EGI's annual Lost Revenue Adjustment Mechanism ("LRAM") and Demand Side Management Incentive Deferral Account ("DSMIDA") amounts. Additional benefits of the evaluation governance structure includes providing information that can help improve program design and delivery.

The disposition of LRAM and DSMIDA amounts is subject to an adjudicative process (DSM Deferral and Variance Account Disposition), during which the OEB will provide a decision on the final amounts.

The specific roles of each party within the evaluation governance structure described in Section 2.0 is provided below:

<u>OEB</u>

- Define the process for the selection of non-utility stakeholder and independent expert members of the EAC.
- Review and make determinations on EGI's DSM Deferral and Variance Account Disposition applications.

<u>Evaluation Contractor</u>

- Execute impact evaluation and annual verification activities for EGI's DSM programs, including:
  - Developing the Ontario Natural Gas DSM EM&V Plan, with input from the EAC;
  - Developing all impact evaluation and annual verification project materials, and providing them to the EAC for input; and,
  - Conducting and finalizing all impact evaluation and annual verification activities and assessments, with input from the EAC.
- Update the Technical Resource Manual ("TRM"), including facilitating the annual update process with input from the EAC.
- Prepare and finalize the EC's final Ontario Natural Gas DSM Annual

Verification Report, with input from the EAC, which includes the EC's verified DSM results for each year.

- Provide EGI with sufficient information/calculations of the EC's final DSM results, to allow EGI to accurately report the EC's final DSM results for other reporting requirements (DSM annual reports, interrogatory responses, etc.) and to allow EGI to update its tracking databases with post-audit information/calculations.
- Provide input to EGI on process evaluation scope of work and draft/final deliverables.

EAC – OEB Staff Members

- Coordinate all impact evaluation, annual verification, and TRM update activities, including:
  - Hiring the EC and any other third parties to conduct these activities;
  - Providing forecasted budgets and actual spends for these activities to the EAC on a regular basis; and,
  - Providing EGI with financial documentation sufficient for EGI's financial accounting responsibilities in a timely manner.[3] This includes providing a quarterly update for all spends to date, and providing estimates of outstanding spends that have not yet been invoiced but will be invoiced within the current calendar year, by October 31st of each year, for accrual purposes.
- Coordinate and facilitate EAC meetings.
- Support impact evaluation and annual verification activities, by:
  - Providing input to the EC on the Ontario Natural Gas DSM EM&V Plan; and,
  - Providing input to the EC on impact evaluation and annual

[3] Evaluation spends are funded through EGI's DSM budget, and as such are required to be reported by EGI using the same standards as all other DSM spends. Since impact evaluation, annual verification, and TRM update activities are coordinated by OEB Staff and not EGI, it is important that OEB Staff report budget forecasts and actual spends to EGI in a clear and timely manner.

verification activities, including scope of work and deliverables.

- Publish the EC's final Ontario Natural Gas DSM Annual Verification Report on an annual basis.
- Support TRM update process, by:
  - Providing input to the EC on TRM measure updates; and,
  - Publishing final TRM version updates.
- Provide input to EGI on process evaluation scope of work and draft/final deliverables.

<u>EAC – Utility Members</u>

- Support impact evaluation and annual verification activities, by:
  - Providing input to OEB Staff on RFPs and third-party proposals, including proposed approaches, timelines and budgets;
  - Providing input to the EC on the Ontario Natural Gas DSM EM&V Plan;
  - Providing input to the EC on impact evaluation and annual verification activities, including scope of work and deliverables;
  - Providing a pre-audit draft DSM Annual Report to OEB Staff; and,
  - Providing program data and support to the EC as requested.
- Support TRM update process, by:
  - Providing input to OEB Staff on RFPs and third-party proposals, including proposed approaches, timelines and budgets;
  - Submitting research to the EC for the inclusion of new measures into the TRM; and,
  - Providing input to the EC on TRM measure updates.
- Coordinate and execute process evaluation activities, including:
  - Gathering input from the EC and the EAC on the scope of work for process evaluation activities, as well as draft/final report deliverables;
  - Providing planned process evaluation activities to the EC, for insertion into the Ontario Natural Gas DSM EM&V Plan; and,

    - Reporting on finalized process evaluation activities within EGI's DSM Annual Report.
- File DSM Deferral and Variance Account Disposition applications to the OEB for each program year, following the publishing of the EC's final Ontario Natural Gas DSM Annual Verification Report for the program year.

EAC – Stakeholder Members

- Support impact evaluation and annual verification activities, by:
    - Providing input to OEB Staff on RFPs and third-party proposals, including proposed approaches, timelines and budgets;
    - Providing input to the EC on the Ontario Natural Gas DSM EM&V Plan; and,
    - Providing input to the EC on impact evaluation and annual verification activities, including scope of work and deliverables.
- Support TRM update process, by:
    - Providing input to OEB Staff on RFPs and third-party proposals, including proposed approaches, timelines and budgets; and
    - Providing input to the EC on TRM measure updates.
- Provide input to EGI on process evaluation scope of work and draft/final deliverables.

3.1 Issue Resolution

Impact evaluation, annual verification, and TRM update activities involve decision points related to technical, policy, and other issues. The EC and the EAC will attempt to achieve consensus on all impact evaluation, verification, and TRM update related decisions. However, if consensus is not possible, for the purpose of finalizing the EC's Ontario Natural Gas DSM Annual Verification Report and TRM without delay, the following parties will be relied upon to make decisions for the following issues.

Technical issues – impact evaluation, annual verification, and TRM updates

- The EC, with input from the EAC, makes decisions on technical issues, to finalize the EC's Ontario Natural Gas DSM Annual Verification Report and TRM. This can include recommending approaches or methodologies based on their expert opinion.
- Should EAC members disagree with the EC's decision(s) on these issues, they may file evidence and argument to the OEB via the utility's DSM Deferral and Variance Account Disposition proceeding for that program year. The OEB will make any final determinations necessary.

Policy issues – impact evaluation, annual verification, and TRM updates

- Any party may identify policy issues that would benefit from a resolution. If consensus is not reached, OEB Staff, with input from the EAC, will direct the EC how to proceed, based on their judgement of relevant OEB DSM references (frameworks, filing guidelines, Decisions, etc.) and the EC's experience with similar policies in other jurisdictions.
- OEB Staff's policy instructions to the EC are delivered to move the process forward and to finalize the EC's Ontario Natural Gas DSM Annual Verification Report and TRM without delay, but are not considered a decision or direction from the OEB. Material policy disagreements between parties are to be documented and maintained by OEB Staff.
- Should EAC members disagree with OEB Staff's decision(s) on these issues, they may file evidence and argument to the OEB via the utility's DSM Deferral and Variance Account Disposition proceeding for that program year. The OEB will make any final determinations necessary.

Other (procurement and administrative) issues – impact evaluation, annual verification, and TRM updates

- OEB Staff, with input from the EAC, will make decisions related to all other impact evaluation, annual verification, and TRM update issues, including but not limited to the procurement of contractors, and administrative matters such as the posting of documents/reports.

- Should EAC members disagree with OEB Staff's decision(s) on these issues, they may file evidence and argument to the OEB via the utility's DSM Deferral and Variance Account Disposition proceeding for that program year. The OEB will make any final determinations necessary.

It is important to ensure that all parties' efforts and positions remain independent, and are not unduly influenced by other parties. Though all parties provide input and advice to each other (and to contracted third parties), all parties must represent and maintain their independent professional opinion.

3.2 EAC Meeting Frequency and Preparation

OEB Staff are responsible for scheduling and cancelling meetings, with early notice whenever possible. The EC and EAC members should inform OEB Staff if they are unable to attend a meeting.

Meetings will be held by teleconference unless otherwise noted by OEB Staff. From time to time, OEB Staff may host in-person EAC meetings.

3.2.1 EAC Meeting Responsibilities

- OEB Staff will chair each EAC meeting, or designate another party to chair the meeting if required. OEB Staff will coordinate attendance through online meeting invitations. The chair of the committee will:
  - Circulate an agenda in advance of the meeting, noting the purpose of each item (for discussion, for information, etc.);
  - Provide (or ensure the EC provides) any materials in advance of the meeting;
  - Preside over the committee meeting; and,
  - Confirm any decisions and/or action items at the close of the meeting.

- All parties will:
    - Attend and actively participate in meetings as appropriate;
    - Share their knowledge, expertise, and experience as they relate to the topic areas being discussed;
    - Follow up on action items as assigned;
    - Abide by the OEB's rules on the treatment of confidential items brought forth for discussion; and,
    - Treat each other with courtesy and respect.

3.3 EAC Documentation Management

Any materials for which the EC is requesting EAC input on will be delivered to all parties at the same time. Substantive comments from each party for significant documents will be recorded in a comment matrix by the EC and will be posted on the EC's document sharing website or a similarly accessible space.

Examples of impact evaluation, annual verification, and TRM update materials for which the EAC can provide input and advice include:

- Plans, scope of work, methodologies, timelines, reporting, and budgets/spends; and
- RFPs and third-party proposals, including proposed approaches, timelines and budgets.

Examples of process evaluation material for which the EC and the EAC can provide input and advice include scope of work and draft/final deliverables.

Parties are asked to complete their review of materials within the comment period provided, and in as thorough manner as possible. If the comment period provided does not allow enough time to complete the analysis, parties are to inform the other parties with alternative arrangement options.

OEB Staff may circulate documentation to the EAC while excluding the EC, particularly if the documentation is related to the procurement of contractors (i.e., an RFP the EC may bid on). OEB Staff may exclude other EAC members from circulation or discussions if there is a pertinent reason to do so, but should let the EAC know the reason for the exclusion.

Observers from the IESO and the MOE will be invited to all EAC meetings, and kept informed of all ongoing activities, but will not be sent non-final documents unless specifically requested.

EAC members are not to share, or otherwise use beyond their involvement within the EAC, any non-final documents that have been received through participation at the EAC, without explicit permission from the EC and all other EAC members.

All EAC members, with the exception of observers from the IESO and MOE, must sign the OEB's Confidentiality Declaration and Undertaking. IESO and MOE representatives are subject to similar confidentiality restrictions through their respective organizations.

The Confidentiality Declaration and Undertaking can be renewed and/or revised by the OEB when necessary, after which it will be brought forward to the EAC by OEB Staff for re-execution.

3.4 Conflicts of Interest

Parties may have actual or potential conflicts of interest arising from their engagement with EGI or another party on matters related to DSM. Parties must declare any actual or potential conflicts of interest to the EAC as soon as possible and provide any relevant updates to these conflicts as they arise.

3.5 Participant Costs

Cost awards will be available under Section 30 of the Ontario Energy Board Act, 1998 to eligible persons in relation to their participation on the EAC or other consultations during the course of the DSM evaluation process. OEB Staff will initiate a cost awards process at least once a year, and no later than October 15 of each year, to ensure that EAC members (specifically non-utility stakeholders and independent experts) are compensated for their contributions to the EAC, and to ensure EGI can process and report its financial accounting responsibilities in a timely manner. Maximum cost claims will be set based on meeting hours (maximum cost award of 1.5 times meeting time to take into consideration preparation and follow-up time) and volume of documentation to review (maximum cost will vary, to be determined with input from those involved).

Appendix A: Evaluation Advisory Committee Members – May 3, 2021

Role	Name
OEB Staff	Josh Wasylyk Valerie Bennett
Enbridge Gas Inc.	Haris Ginis Eric Buan Erin Dunlop
Non-utility Stakeholders	Chris Neme, Energy Futures Group
	Jay Shepherd, Shepherd Rubenstein Professional Corporation
Independent Experts	Bob Wirtshafter, Wirtshafter Associates, Inc.
	Ted Kesik, University of Toronto
Independent Electricity System Operator (“IESO”)	To be confirmed
Ontario Ministry of Energy, Northern Development and Mines (“MOE”)	To be confirmed

DSM AND INTERGRATED RESOURCE PLANNING

1. Integrated Resource Planning ("IRP") was mentioned in the DSM Letter on December 1, 2020, specifically by including IRP in the DSM Framework as a secondary objective to, "Create opportunities to defer and/or avoid future natural gas infrastructure projects." The DSM Letter also in a footnote stated,

> The OEB has an ongoing hearing that is considering Enbridge Gas's proposed Integrated Resource Planning framework (EB-2020-0091). As part of that proceeding, the OEB will decide on the relationship between the IRP framework and future utility DSM plans and the extent to which Enbridge Gas will be expected to meet this secondary objective as part of its future DSM plan.[1]

2. At the time of this DSM Plan submission, the OEB has not rendered a decision on the IRP framework, so Enbridge Gas has not had any opportunity to consider the OEB's findings. Enbridge Gas has submitted this DSM Plan with no funding proposed for any IRP or geo-targeted energy efficiency programming (or enhanced targeted energy efficiency referred to as "ETEE" or "ETEE's" hereafter).

3. The DSM Plan is underpinned by the assumption that, subject to the guidance set out in the OEB's IRP Framework for Enbridge Gas, all future IRP Plan applications (which may include ETEE's) will be separately reviewed and approved by the OEB.

4. As part of future IRP Plan applications, the Company intends to seek OEB approval (under section 36 of the OEB Act) of distinct project costs, accounting treatment and to record actual costs in an IRP cost deferral account for clearance at a later date. Once approved, IRP Plans are deemed "in-service". Accordingly, the costs associated with future IRP Plans and associated ETEE will remain entirely separate and distinct from OEB-approved DSM budgets.

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

3. While the above assumption allows for a practical approach that minimizes regulatory inefficiencies, there are some aspects that do need to be considered in the DSM Framework. Enbridge Gas therefore proposes the following issues be addressed by the OEB in its decision and order regarding the Proposed Framework and the DSM Plan submission. The Company has suggested a regulatory approach for dealing with these issues at an appropriate time and proceeding.

4. As many stakeholders mentioned in the IRP framework proceeding, ETEE's may form some or all of an IRP plan, and there was interest in understanding a clear delineation of what was:
   i) DSM, which targets annual gas usage reductions by customers but may also broadly reduce the need for infrastructure (driven by peak period demands); and,
   ii) IRPA's such as ETEE's within an IRP Plan, which are specifically intended to reduce the need for infrastructure and may also reduce gas consumption on an annual basis.

5. Since the energy efficiency measures that underpin both DSM programming and ETEE's can be the same measures, aimed at the same customer groups, there are several issues that need to be understood between DSM and IRP, specifically: cost allocation, attribution of results, and impacts to DSM targets.

<u>Cost Allocation:</u>

5. As mentioned above, the same measures for energy efficiency can be part of either a DSM plan or an IRP Plan/ETEE. Enbridge Gas expects that when an IRP Plan is approved that includes an ETEE or multiple ETEE's, it is likely that the current complement of staff working on DSM delivery may be in the best position to deliver an ETEE. Even if there are incremental budget/resources allocated from the IRP plan to such measures, it is likely that some costs, such as existing overheads, should be re-allocated to, or from, the DSM plan and one or more IRP Plans.

Attribution of results:

6. Enbridge Gas proposed in the IRP Framework that if an ETEE is included in an IRP Plan that the cost of the ETEE and the results would be attributed to IRP. With this treatment if follows there would therefore be no impact on the DSM plan results.

Impacts to DSM targets:

7. While future IRP Plans have not been formulated at the time of writing and it is not possible to predict what those plans may contain, or for which time periods they would apply, it is possible that significant adoption of IRP Plans that contain ETEE's may reduce the potential for DSM as the ETEE's are employing the same or similar measures in the same market, targeting the same customers. This could require an adjustment to the DSM Plan scorecard targets at some future point to ensure that they reflect remaining conditions in the market.

8. Enbridge Gas has not included any cost allocation assumptions for any future IRP Plans in its DSM Plan, has not assumed any future IRP attribution, and has not assumed any impacts to targets from future IRP Plans. These critical assumptions underpin the entirety of the DSM Plan. Given the timing of the IRP framework proceeding and the OEB direction to file a multi-year DSM plan by May 2021, it is challenging to see what other course of action would serve to be practical.

9. Enbridge Gas proposes that the DSM Plan and associated scorecards be approved and any changes within the DSM Plan term only be contemplated if certain thresholds are breached in order to minimize unnecessary re-litigation of issues. The following thresholds and operational treatments are proposed:

Re-allocation of DSM Plan costs:

10. Any re-allocation of costs over $1,000,000 in a given year will require Enbridge Gas to file for a adjustment to the DSM Plan. The re-allocation of cost under this

threshold will be either utilized for program costs that deliver value to rate payers or returned to ratepayers through the DSMVA.

Attribution of results and impacts to DSM plan targets:

11. Attribution of results will be based on funding. Any IRP Plan funded ETEE's will be solely attributed to the IRP Plan in which the ETEE was approved. If the impact of an IRP Plan or the cumulative impact of multiple IRP Plans is projected to reduce the DSM Plan results of any single DSM scorecard by more than 10% in a given year, it would be incumbent on Enbridge Gas to file an application to adjust the DSM Plan targets accordingly.

12. Enbridge Gas notes that this application does not ask for relief or funding with respect to any IRP Plan and proposes that IRP not be an issue within this proceeding, as doing so would be duplicative. Rather the OEB should indicate that the above thresholds are reasonable for the time being, and the specifics of those issues be litigated at the 'first applicable instance', which would be at the time of approval of a single IRP Plan that exceeds the relevant threshold, or in the next DSM clearance proceeding where multiple IRP plans cumulative exceed the relevant threshold. Litigation can then fully explore the issues surrounding these items at a time when it is relevant to stakeholders and the OEB. The outcome can be appended to the IRP framework, or applicable guideline can be created from that precedent. This is more practical and efficient than to litigate issues where there is nothing being contemplated or proposed within this application.

ENBRIDGE GAS DSM PLAN PROPOSAL AND BUDGET

Approach to the DSM Plan

1. Enbridge Gas has prepared a 2022-2027 Multi-Year DSM Plan (the "DSM Plan") in accordance with direction provided by the OEB in the DSM Letter[1] and based on the parameters outlined in the Proposed Framework as detailed in Exhibit C.

2. The Proposed Framework is the basis from which the DSM Plan has been developed. The DSM Plan as proposed is intended to be responsive to:
   - The OEB's stated primary and secondary objectives for ratepayer funded natural gas DSM [2]
   - OEB expectations for modest budget increases [3]
   - Incorporation of guiding principles[4] 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,

---
[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020).
[2] Ibid, pp. 2-3.
[3] Ibid, p. 3.
[4] EB-2021-0002, Application, Proposed Framework, Exhibit C, Schedule 1, Tab 1, pp. 6-8.

  - Support for technology development and market adoption of new and lower-carbon alternatives to enable longer term energy efficiency and carbon reductions.
- Examination of existing programming and introduction of new programming to best meet identified needs of diverse customer groups
- Analysis and lessons learned from 2015-2020 DSM program delivery including annual evaluation reports, recommendations from the Evaluation Contractor, and feedback from the 2021 DSM Plan Rollover proceeding
- Incorporation of feedback from customers and input provided through stakeholder consultations, including OEB led Post-2021 Stakeholder Consultations (EB-2019-0003)
- Consideration of the 2019 Integrated Ontario Electricity and Natural Gas Achievable Potential Study
- Attention on cost-effectiveness through a renewed focus to increase total net resource benefits

3. In this filing, to be responsive to guidance provided in the OEB's DSM Letter, Enbridge Gas includes the following plan components:
   i. A set of programs and scorecards, including annual targets, metrics, and associated budgets, designed to achieve the various goals and objectives outlined by the OEB and provide appropriate incentives to the Company to aggressively undertake and deliver its DSM portfolio of offerings. These programs are divided into two categories:
      a. Resource acquisition programs focused on the achievement of net annual natural gas savings (m^3) with proposed first year targets which escalate formulaically for the remainder of the six-year term based on a Target Adjustment Mechanism ("TAM") coupled with budgets proposed for the first year which similarly escalate formulaically for the remainder of the six-year term.

b. Multi-year programs where activities and participation span more than one year and includes a progression of related activities. Given the multi-year nature of these offerings, targets do not lend themselves to a TAM calculation for subsequent years, nor do the programs fit the application of a formulaic budget escalation. For these programs, Enbridge Gas is outlining defined targets and defined budget requirements for each offering for each of the first three years of the six-year term. As further discussed below, Enbridge Gas proposes a mid-point assessment in 2024, at which time the targets and budget requirements for these multi-year program offerings will be proposed for the second three-year period of the plan.

The scorecards for each of these programs is detailed in Exhibit D, Tab 1, Schedule 2.

ii. Alignment of utility and ratepayer interests by directing a portion of the shareholder incentive opportunity to a shared savings mechanism earned in relation to a growing percent of net benefits achieved annually. The proposal for a shareholder incentive focused on this objective is detailed in Exhibit D, Tab 1, Schedule 2.

iii. A Low Carbon Transition Program encompassing a three year aggregate target and budget which is intended, through a longer term focus, to support market deployment initiatives and overcome market barriers to early adoption of heat pump technologies that operate at performance levels beyond 100% efficiency. The scorecard for this program is detailed in Exhibit D, Tab 1, Schedule 2.

iv. A 2027 long term GHG reduction goal (“GHG Goal”), which provides a means for aggregating the value, importance, and success of natural gas DSM in Ontario expressed in terms of associated GHG reductions. The proposed target metric is the GHG reductions realized through the summation of annual gross natural gas savings targeted in the first year of the plan multiplied by the six-year term of the

DSM Plan, with an additional 15% stretch target. The proposal for a shareholder incentive focused on this objective is detailed in Exhibit D, Tab 1, Schedule 2.

Six-Year Term

4. Enbridge Gas proposes a six-year DSM Plan that provides for regulatory efficiency and is supportive of government policy but is also flexible to adapt to policy changes that may occur during the plan term. A six-year term allows for long term planning and program continuity while minimizing the need for redundant regulatory review. A six-year term provides stability for the Company to commit to energy conservation efforts, as well as certainty for customers and other market participants of sustained DSM support across Ontario. As acknowledged in the November 27, 2020 letter from the Ministry of Energy, Northern Development and Mines to the OEB, "DSM programs help customers manage their energy costs and are an important contributor to Ontario's economy."[5] In the wake of the COVID-19 pandemic, certainty and opportunity for contractors, delivery agents, vendors and manufacturers will be vital in the coming years. Therefore, Enbridge Gas is proposing a six-year DSM budget term which will consist of an initial three-year DSM plan proposal (2022-2024) designed to be continued for the remaining three-year period (2025-2027) following a limited mid-point assessment which is described in greater detail below.

Mid-Point Assessment

5. Enbridge Gas believes it is appropriate and prudent to assess the program portfolio in certain specific areas towards the end of the first three-years of the plan to ensure the plan continues to be aligned with the market and evolving policy in Ontario. A

[5] MC-994-2020-1084, Ministry of Energy, Northern Development and Mines, Letter to OEB (November 27, 2020), p. 2.

limited mid-point assessment will provide an opportunity to determine if any additional program offerings merit introduction, or if changing market factors/ government policy necessitate some re-consideration in program design or delivery.

6. In particular, in respect of offerings that have a program design and proposed metrics that reflect a progressive multi-year evolution, Enbridge Gas has determined it is most appropriate to detail these efforts, metrics and targets for only a three-year period. At the mid-point assessment, the Company will evaluate how the market has advanced to determine how best to support subsequent efforts to advance the objectives of these offerings and benefit participants for the final three-year period of the six-year term. Of note, the Building Beyond Code program (detailed in Exhibit E, Tab 2, Schedule 2) and Low Carbon Transition program (detailed in Exhibit E, Tab 3, Schedule 1) will likely merit assessment at the mid-point.

7. Enbridge Gas recognizes that a mid-point assessment should have a limited scope such that regulatory efficiency is achieved and any matters for consideration focus primarily on items that require OEB approval. Specifically, topics limited to the following categories are proposed by Enbridge Gas, as appropriate, at the mid-point assessment:
   - Any introduction by Enbridge Gas of new program offerings requiring specific budget asks or budget flexibility beyond that already afforded in the Proposed Framework and, if appropriate, any related considerations for new or updated metrics or targets.
   - Consideration of any re-weighting of metrics and scorecards as a result of recommendations for new or discontinued offerings.
   - For multi-year offerings, the DSM Plan outlines targets and metrics for the first 2022-2024 period. The mid-point assessment will be the opportunity for Enbridge Gas to establish objectives, define metrics and propose scorecards and targets for the second half of the six-year term, 2025-2027, for these offerings.

- Any other changes to the DSM Plan deemed appropriate by Enbridge Gas for program offerings to ensure they are meeting customer needs and the objectives for the offerings. Such proposals for adjustments may be in response to the changing energy landscape or in consideration of other external factors that are impacting or anticipated to impact DSM program delivery.

8. There is also recognition that there may be changes to rates and rate classes as a result of the rate harmonization effort that is currently ongoing in preparation for the utility rate rebasing application which is anticipated to be filed at the end of 2022. The mid-point assessment will allow Enbridge Gas to propose any necessary DSM Plan changes required to align with the outcomes of rebasing.

9. Enbridge Gas proposes that the mid-point assessment take the form of an application made by the Company to the OEB in 2024 outlining the DSM programs and supporting details for the second three-year period from 2025-2027 with a description of any changes that Enbridge Gas proposes. The application will be based on the results and outcomes of DSM program execution in 2022-2024, any government policy changes that have arisen, and any changes in the energy market landscape. Enbridge Gas will reasonably consider the feedback of customers and stakeholders received as part of its stakeholdering efforts for the purposes of informing the mid-point assessment application.

DSM Plan Budget Envelope

10. The OEB outlined its budget expectations in its DSM Letter stating "the OEB anticipates modest budget increases to be proposed by Enbridge Gas in the near-term in order to increase natural gas savings."[6] The OEB further detailed that "the

---

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

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."[7]

11. Comments outlined by the OEB in the 2015-2020 DSM Framework remain relevant in consideration of budget proposals today:

> Ultimately, distribution customers are responsible for financially supporting all DSM activities in Ontario. Although some of these customers will participate in the programs offered by the gas utilities and benefit from the natural gas savings, a large majority of customers will not participate for a number of reasons. Many elements of DSM programs that offer the greatest opportunity to realize long-term natural gas savings (and bill reductions) are related to the installation of energy efficient products, such as a furnace or insulation. The opportunity to install one of these more significant items will not be present for the majority of customers in the gas utilities' service territories. As a result of this, the many customers who do not participate in any DSM program end up cross-subsidizing, through natural gas distribution rates, energy efficiency upgrades for those customers who do participate. Because of this, the Board must be mindful of the overall impact additional costs have on all customers (both participants in DSM programs and non-participants).[8]

12. It is appropriate to note that the Company has been operating in 2021 with an approved DSM budget which is the same as that approved for 2020. There was no increase over the 2020 approved budget.

13. Given this and based on the above noted guidance from the OEB, Enbridge Gas is proposing a 2022 base year budget of $136 million for the first year of its 2022-2027 DSM Plan. This represents an increase of approximately 3% over 2020/2021 budget levels which Enbridge Gas believes is a modest but appropriate increase. For the balance of the six year budget term (2023-2027), Enbridge Gas proposes to

[7] Ibid.
[8] EB-2014-0134, OEB Report of the Board, Demand Side Management Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 15.

escalate the entire 2022 base year budget of $136 million by an inflation factor[9] which for illustrative purposes here is estimated at 2%. In addition, to support modest increases for the expansion of DSM programs, Enbridge Gas is proposing that the portion of the budget directly related to programs be escalated annually by an additional 3% to reflect Government policy that supports the growth of energy conservation and GHG reduction initiatives while at the same time being mindful of the OEB's and ratepayer concerns about bill impacts. Enbridge Gas submits that a formulaic budget increase of 2% inflation to the entire budget plus a 3% increase to program budgets (administrative overheads, evaluation, research and innovation are not subject to this increase), balances bill impacts with the level of natural gas savings being targeted in the DSM Plan. In this way, the administrative cost of undertaking DSM activities is being limited to inflationary increases only whereas program budgets will increase modestly by 3% over inflation to achieve Government of Ontario policy objectives. At a portfolio level, the six-year budget proposal is illustrated in Table 1 below, and a further breakdown of the six-year budget proposal is outlined in Table 2.

Table 1: 2022-2027 Six-Year DSM Portfolio Budget Envelope

Six Year 2022+ DSM Multi Year Plan Portfolio Budget						
	2022 Base Year	**2023**	**2024**	**2025**	**2026**	**2027**
Program Budget	$118,000,000	$123,900,000	$130,095,000	$136,599,750	$143,429,738	$150,601,225
		Formulaic increase of 5% (3% policy growth + 2% inflation) over year prior				
Portfolio Admin, Evaluation, Research & Development	$18,000,000	$18,360,000	$18,727,200	$19,101,744	$19,483,779	$19,873,455
		Formulaic increase of 2% inflation over year prior				
Total Budget Envelope	$136,000,000	$142,260,000	$148,822,200	$155,701,494	$162,913,517	$170,474,680

[9] The inflation factor will be adjusted by the Consumer Price Index (CPI) as part of the annual rates proceeding.

Table 2: 2022-2027 Six-Year DSM Plan Budget

DSM Budget Category	2022 Base Year	2023	2024	2025	2026	2027
Residential Program	$39,947,692	$40,804,802	$41,762,686	$42,597,940	$43,449,899	$44,318,896
Low Income Program	$22,536,946	$22,987,685	$23,447,439	$23,916,388	$24,394,716	$24,882,610
Commercial Program	$24,824,442	$25,262,775	$25,626,242	$26,138,767	$26,661,542	$27,194,773
Industrial Program	$17,478,543	$17,828,114	$18,184,676	$18,548,370	$18,919,337	$19,297,724
Large Volume Industrial	$2,712,377	$2,766,624	$2,821,957	$2,878,396	$2,935,964	$2,994,683
Energy Performance	$1,220,594	$1,221,656	$1,222,739	$1,247,194	$1,272,138	$1,297,580
Building Beyond Code Program[1]	$6,189,013	$8,437,503	$9,546,354	**$21,272,696 to be reassessed**	**$25,796,143 to be reassessed**	**$30,614,958 to be reassessed**
Low Carbon Transition	$3,090,393	$4,590,841	$7,482,907			
Program Subtotal	**$118,000,000**	**$123,900,000**	**$130,095,000**	**$136,599,750**	**$143,429,738**	**$150,601,225**
Administration Costs	$11,031,884	$11,252,522	$11,477,572	$11,707,123	$11,941,266	$12,180,092
Evaluation and Regulatory Costs	$3,800,000	$3,876,000	$3,953,520	$4,032,590	$4,113,242	$4,195,507
Research and Development	$3,168,116	$3,231,478	$3,296,108	$3,362,030	$3,429,271	$3,497,856
Portfolio Subtotal	**$18,000,000**	**$18,360,000**	**$18,727,200**	**$19,101,744**	**$19,483,779**	**$19,873,455**
Total	**$136,000,000**	**$142,260,000**	**$148,822,200**	**$155,701,494**	**$162,913,517**	**$170,474,680**

1. The Building Beyond Code and Low Carbon Transition budgets to be reassessed at the mid-point assessment.

14. The detailed allocation of the proposed base year budget for the 2022 DSM Plan is detailed in Table 3 below. This table provides a breakdown of the 2022 budgets by program, and further by offering, categorized into incentive, promotion, delivery, and program admin costs. The table also provides a breakdown of portfolio level budgets which include categories of administration, evaluation and regulatory, and research and development. The references provided in the left column of the table indicate the sections of the DSM Plan submission where details supporting the budget components can be found, including details for each of the programs and explanations supporting the portfolio level budget items. Tables 4 through 8 that follow outline the budgets for each subsequent DSM Plan year to 2027.

Table 3: 2022 DSM Plan Budget

Reference: Exhibit, Tab, Schedule	2022 DSM Budget Item	Incentive Costs	Promotion Costs	Delivery Costs	Admin Costs	2022 Total
E-1-2	**Residential Program**	**$31,786,753**	**$3,086,749**	**$3,524,950**	**$1,549,240**	**$39,947,692**
	Residential Whole Home	$25,567,431	$1,497,935	$2,906,950		$29,972,316
	Residential Single Measure	$3,488,072	$788,814	$250,000		$4,526,886
	Residential Smart Home	$2,731,250	$800,000	$368,000		$3,899,250
E-1-3	**Low Income Program**	**$15,309,199**	**$3,280,000**	**$2,503,000**	**$1,444,747**	**$22,536,946**
	Home Winterproofing	$9,325,250	$2,450,000	$2,318,000		$14,093,250
	Affordable Housing Multi-Residential	$5,983,949	$830,000	$185,000		$6,998,949
E-1-4	**Commercial Program**	**$17,579,680**	**$1,208,900**	**$2,312,564**	**$3,723,298**	**$24,824,442**
	Commercial Custom	$10,730,000	$607,500	$329,000		$11,666,500
	Prescriptive Downstream	$2,098,068	$130,400	$160,000		$2,388,468
	Direct Install	$4,241,532	$271,000	$160,000		$4,672,532
	Prescriptive Midstream	$510,080	$200,000	$1,663,564		$2,373,644
E-1-5	**Industrial Program**	**$13,200,000**	**$400,000**	**$0**	**$3,878,543**	**$17,478,543**
	Industrial Custom	$13,200,000	$400,000	$0		$13,600,000
E-1-6	**Large Volume Program**	**$2,450,000**	**$50,000**	**$0**	**$212,377**	**$2,712,377**
	Direct Access	$2,450,000	$50,000	$0		$2,500,000
E-1-7	**Energy Performance Program**	**$637,500**	**$30,000**	**$450,000**	**$103,094**	**$1,220,594**
	Whole Building Pay For Performance (P4P)	$637,500	$30,000	$450,000		$1,117,500
E-2-2	**Building Beyond Code Program**	**$1,328,000**	**$1,484,806**	**$2,863,000**	**$513,207**	**$6,189,013**
	Residential Savings By Design	$450,000	$1,000,000	$810,000		$2,260,000
	Commercial Savings By Design	$0	$200,000	$925,000		$1,125,000
	Affordable Housing Savings By Design	$828,000	$160,000	$828,000		$1,816,000
	Commercial Air Tightness Testing	$50,000	$124,806	$300,000		$474,806
E-3-1	**Low Carbon Transition Program** [1]	**$2,472,000**	**$418,706**	**$0**	**$199,687**	**$3,090,393**
	Residential Low Carbon	$1,800,000	$261,539	$0		$2,061,539
	Commercial Low Carbon	$672,000	$157,167	$0		$829,167
	Program Subtotal	**$84,763,133**	**$9,959,161**	**$11,653,513**	**$11,624,193**	**$118,000,000**
E-4-1	**Administration Costs**				**$11,031,884**	**$11,031,884**
	Portfolio Administration				$8,401,884	$8,401,884
	System Maintenance & Improvements				$1,000,000	$1,000,000
	Municipal Engagement				$1,630,000	$1,630,000
E-4-2	**Evaluation and Regulatory Costs**				**$3,800,000**	**$3,800,000**
	EM&V				$2,600,000	$2,600,000
	Regulatory & Stakeholdering				$700,000	$700,000
	Process and Market Evaluation				$500,000	$500,000
E-4-3	**Research and Development Costs**				**$3,168,116**	**$3,168,116**
	Research Innovation Fund				$2,550,000	$2,550,000
	Market Data				$618,116	$618,116
	Portfolio Subtotal				**$18,000,000**	**$18,000,000**
	Total	**$84,763,133**	**$9,959,161**	**$11,653,513**	**$29,624,193**	**$136,000,000**

1. The Low Carbon Transition program has a three year budget (amounts detailed in the 2022 DSM Plan Budget serve to indicate the portion of the 2022 budget allocated to that three year program budget which is illustrated in Table 10)

Table 4: 2023 DSM Plan Budget

2023 DSM Budget Item	Incentive Costs	Promotion Costs	Delivery Costs	Admin Costs	2023 Total
Residential Program	**$32,484,644**	**$3,148,484**	**$3,591,449**	**$1,580,225**	**$40,804,802**
Residential Whole Home	$26,140,935	$1,527,894	$2,961,089		$30,629,918
Residential Single Measure	$3,557,834	$804,590	$255,000		$4,617,424
Residential Smart Home	$2,785,875	$816,000	$375,360		$3,977,235
Low Income Program	**$15,615,383**	**$3,345,600**	**$2,553,060**	**$1,473,642**	**$22,987,685**
Home Winterproofing	$9,511,755	$2,499,000	$2,364,360		$14,375,115
Affordable Housing Multi-Residential	$6,103,628	$846,600	$188,700		$7,138,928
Commercial Program	**$17,931,274**	**$1,233,078**	**$2,354,815**	**$3,743,608**	**$25,262,775**
Commercial Custom	$10,944,600	$619,650	$331,580		$11,895,830
Prescriptive Downstream	$2,140,029	$133,008	$163,200		$2,436,237
Direct Install	$4,326,363	$276,420	$163,200		$4,765,983
Prescriptive Midstream	$520,282	$204,000	$1,696,835		$2,421,117
Industrial Program	**$13,464,000**	**$408,000**	**$0**	**$3,956,114**	**$17,828,114**
Industrial Custom	$13,464,000	$408,000	$0		$13,872,000
Large Volume Program	**$2,499,000**	**$51,000**	**$0**	**$216,624**	**$2,766,624**
Direct Access	$2,499,000	$51,000	$0		$2,550,000
Energy Performance Program	**$637,500**	**$30,000**	**$450,000**	**$104,156**	**$1,221,656**
Whole Building Pay For Performance (P4P)	$637,500	$30,000	$450,000		$1,117,500
Building Beyond Code Program	**$2,818,600**	**$1,393,432**	**$3,702,900**	**$522,571**	**$8,437,503**
Residential Savings By Design	$1,600,000	$900,000	$1,557,500		$4,057,500
Commercial Savings By Design	$0	$200,000	$1,036,000		$1,236,000
Affordable Housing Savings By Design	$993,600	$160,000	$984,400		$2,138,000
Commercial Air Tightness Testing	$225,000	$133,432	$125,000		$483,432
Low Carbon Transition Program [1]	**$3,965,550**	**$421,611**	**$0**	**$203,680**	**$4,590,841**
Residential Low Carbon	$2,436,750	$264,444	$0		$2,701,194
Commercial Low Carbon	$1,528,800	$157,167	$0		$1,685,967
Program Subtotal	**$89,415,951**	**$10,031,205**	**$12,652,224**	**$11,800,620**	**$123,900,000**
Administration Costs				**$11,252,522**	**$11,252,522**
Portfolio Administration				$8,569,922	$8,569,922
System Maintenance & Improvements				$1,020,000	$1,020,000
Municipal Engagement				$1,662,600	$1,662,600
Evaluation and Regulatory Costs				**$3,876,000**	**$3,876,000**
EM&V				$2,652,000	$2,652,000
Regulatory & Stakeholdering				$714,000	$714,000
Process and Market Evaluation				$510,000	$510,000
Research and Development Costs				**$3,231,478**	**$3,231,478**
Research Innovation Fund				$2,601,000	$2,601,000
Market Data				$630,478	$630,478
Portfolio Subtotal				**$18,360,000**	**$18,360,000**
Total	**$89,415,951**	**$10,031,205**	**$12,652,224**	**$30,160,620**	**$142,260,000**

1. The Low Carbon Transition program has a three year budget (the amounts detailed in the 2023 DSM Plan Budget serve to indicate the portion of the 2023 budget allocated to that three year program budget which is illustrated in Table 10).

Table 5: 2024 DSM Plan Budget

2024 DSM Budget Item	Incentive Costs	Promotion Costs	Delivery Costs	Admin Costs	2024 Total
Residential Program	**$33,172,339**	**$3,401,790**	**$3,576,728**	**$1,611,830**	**$41,762,686**
Residential Whole Home	$26,701,756	$1,748,788	$2,933,761		$31,384,304
Residential Single Measure	$3,628,990	$820,682	$260,100		$4,709,772
Residential Smart Home	$2,841,593	$832,320	$382,867		$4,056,780
Low Income Program	**$15,927,691**	**$3,412,512**	**$2,604,121**	**$1,503,115**	**$23,447,439**
Home Winterproofing	$9,701,990	$2,548,980	$2,411,647		$14,662,617
Affordable Housing Multi-Residential	$6,225,701	$863,532	$192,474		$7,281,707
Commercial Program	**$18,289,899**	**$1,257,740**	**$2,315,362**	**$3,763,241**	**$25,626,242**
Commercial Custom	$11,163,492	$632,043	$251,662		$12,047,197
Prescriptive Downstream	$2,182,830	$135,668	$166,464		$2,484,962
Direct Install	$4,412,890	$281,948	$166,464		$4,861,302
Prescriptive Midstream	$530,688	$208,080	$1,730,772		$2,469,540
Industrial Program	**$13,733,280**	**$416,160**	**$0**	**$4,035,236**	**$18,184,676**
Industrial Custom	$13,733,280	$416,160	$0		$14,149,440
Large Volume Program	**$2,548,980**	**$52,020**	**$0**	**$220,957**	**$2,821,957**
Direct Access	$2,548,980	$52,020	$0		$2,601,000
Energy Performance Program	**$637,500**	**$30,000**	**$450,000**	**$105,239**	**$1,222,739**
Whole Building Pay For Performance (P4P)	$637,500	$30,000	$450,000		$1,117,500
Building Beyond Code Program	**$3,579,200**	**$1,107,231**	**$4,327,800**	**$532,123**	**$9,546,354**
Residential Savings By Design	$2,150,000	$650,000	$1,915,000		$4,715,000
Commercial Savings By Design	$0	$200,000	$1,147,000		$1,347,000
Affordable Housing Savings By Design	$1,159,200	$160,000	$1,140,800		$2,460,000
Commercial Air Tightness Testing	$270,000	$97,231	$125,000		$492,231
Low Carbon Transition Program [1]	**$6,605,120**	**$670,033**	**$0**	**$207,754**	**$7,482,907**
Residential Low Carbon	$4,762,720	$512,866	$0		$5,275,586
Commercial Low Carbon	$1,842,400	$157,167	$0		$1,999,567
Program Subtotal	**$94,494,009**	**$10,347,485**	**$13,274,011**	**$11,979,495**	**$130,095,000**
Administration Costs				**$11,477,572**	**$11,477,572**
Portfolio Administration				$8,741,320	$8,741,320
System Maintenance & Improvements				$1,040,400	$1,040,400
Municipal Engagement				$1,695,852	$1,695,852
Evaluation and Regulatory Costs				**$3,953,520**	**$3,953,520**
EM&V				$2,705,040	$2,705,040
Regulatory & Stakeholdering				$728,280	$728,280
Process and Market Evaluation				$520,200	$520,200
Research and Development Costs				**$3,296,108**	**$3,296,108**
Research Innovation Fund				$2,653,020	$2,653,020
Market Data				$643,088	$643,088
Portfolio Subtotal				**$18,727,200**	**$18,727,200**
Total	**$94,494,009**	**$10,347,485**	**$13,274,011**	**$30,706,695**	**$148,822,200**

1. The Low Carbon Transition program has a three year budget (the amounts detailed in the 2024 DSM Plan Budget serve to indicate the portion of the 2024 budget allocated to that three year program budget which is illustrated in Table 10).

Table 6: 2025 DSM Plan Budget

2025 DSM Budget	Incentive Costs	Promotion Costs	Delivery Costs	Admin Costs	2025 Total
Residential Program	**$33,835,785**	**$3,469,825**	**$3,648,262**	**$1,644,067**	**$42,597,940**
Residential Whole Home	$27,235,791	$1,783,763	$2,992,436		$32,011,990
Residential Single Measure	$3,701,570	$837,096	$265,302		$4,803,967
Residential Smart Home	$2,898,425	$848,966	$390,525		$4,137,916
Low Income Program	**$16,246,244**	**$3,480,762**	**$2,656,204**	**$1,533,177**	**$23,916,388**
Home Winterproofing	$9,896,030	$2,599,959	$2,459,880		$14,955,869
Affordable Housing Multi-Residential	$6,350,215	$880,803	$196,323		$7,427,341
Commercial Program	**$18,655,697**	**$1,282,894**	**$2,361,669**	**$3,838,506**	**$26,138,767**
Commercial Custom	$11,386,762	$644,684	$256,695		$12,288,141
Prescriptive Downstream	$2,226,487	$138,381	$169,793		$2,534,661
Direct Install	$4,501,148	$287,587	$169,793		$4,958,528
Prescriptive Midstream	$541,301	$212,242	$1,765,387		$2,518,931
Industrial Program	**$14,007,946**	**$424,483**	**$0**	**$4,115,941**	**$18,548,370**
Industrial Custom	$14,007,946	$424,483	$0		$14,432,429
Large Volume Program	**$2,599,960**	**$53,060**	**$0**	**$225,376**	**$2,878,396**
Direct Access	$2,599,960	$53,060	$0		$2,653,020
Energy Performance Program	**$650,250**	**$30,600**	**$459,000**	**$107,344**	**$1,247,194**
Whole Building Pay For Performance (P4P)	$650,250	$30,600	$459,000		$1,139,850
Building Beyond Code Program[1]	**$21,272,696 to be reassessed**				
Residential Savings By Design					
Commercial Savings By Design					
Affordable Housing Savings By Design					
Commercial Air Tightness Testing					
Low Carbon Transition Program[1]					
Residential Low Carbon					
Commercial Low Carbon					
Program Subtotal	**$98,823,998**	**$10,980,258**	**$14,576,409**	**$12,219,085**	**$136,599,750**
Administration Costs				**$11,707,123**	**$11,707,123**
Portfolio Administration				$8,916,147	$8,916,147
System Maintenance & Improvements				$1,061,208	$1,061,208
Municipal Engagement				$1,729,769	$1,729,769
Evaluation and Regulatory Costs				**$4,032,590**	**$4,032,590**
EM&V				$2,759,141	$2,759,141
Regulatory & Stakeholdering				$742,846	$742,846
Process and Market Evaluation				$530,604	$530,604
Research and Development Costs				**$3,362,030**	**$3,362,030**
Research Innovation Fund				$2,706,080	$2,706,080
Market Data				$655,950	$655,950
Portfolio Subtotal				**$19,101,744**	**$19,101,744**
Total	**$98,823,998**	**$10,980,258**	**$14,576,409**	**$31,320,829**	**$155,701,494**

1. The Building Beyond Code and Low Carbon Transition budget to be reassessed at the mid-point assessment.

Table 7: 2026 DSM Plan Budget

2026 DSM Budget	Incentive Costs	Promotion Costs	Delivery Costs	Admin Costs	2026 Total
Residential Program	**$34,512,501**	**$3,539,222**	**$3,721,228**	**$1,676,948**	**$43,449,899**
Residential Whole Home	$27,780,507	$1,819,439	$3,052,285		$32,652,230
Residential Single Measure	$3,775,601	$853,838	$270,608		$4,900,047
Residential Smart Home	$2,956,393	$865,946	$398,335		$4,220,674
Low Income Program	**$16,571,169**	**$3,550,378**	**$2,709,328**	**$1,563,841**	**$24,394,716**
Home Winterproofing	$10,093,951	$2,651,958	$2,509,078		$15,254,987
Affordable Housing Multi-Residential	$6,477,219	$898,419	$200,250		$7,575,888
Commercial Program	**$19,028,811**	**$1,308,552**	**$2,408,902**	**$3,915,276**	**$26,661,542**
Commercial Custom	$11,614,497	$657,578	$261,829		$12,533,903
Prescriptive Downstream	$2,271,016	$141,149	$173,189		$2,585,354
Direct Install	$4,591,171	$293,339	$173,189		$5,057,699
Prescriptive Midstream	$552,127	$216,487	$1,800,695		$2,569,309
Industrial Program	**$14,288,105**	**$432,973**	**$0**	**$4,198,260**	**$18,919,337**
Industrial Custom	$14,288,105	$432,973	$0		$14,721,077
Large Volume Program	**$2,651,959**	**$54,122**	**$0**	**$229,884**	**$2,935,964**
Direct Access	$2,651,959	$54,122	$0		$2,706,080
Energy Performance Program	**$663,255**	**$31,212**	**$468,180**	**$109,491**	**$1,272,138**
Whole Building Pay For Performance (P4P)	$663,255	$31,212	$468,180		$1,162,647
Building Beyond Code Program[1]	**$25,796,143 to be reassessed**				
Residential Savings By Design					
Commercial Savings By Design					
Affordable Housing Savings By Design					
Commercial Air Tightness Testing					
Low Carbon Transition Program[1]					
Residential Low Carbon					
Commercial Low Carbon					
Program Subtotal	**$103,362,593**	**$11,646,977**	**$15,956,701**	**$12,463,467**	**$143,429,738**
Administration Costs				**$11,941,266**	**$11,941,266**
Portfolio Administration				$9,094,469	$9,094,469
System Maintenance & Improvements				$1,082,432	$1,082,432
Municipal Engagement				$1,764,364	$1,764,364
Evaluation and Regulatory Costs				**$4,113,242**	**$4,113,242**
EM&V				$2,814,324	$2,814,324
Regulatory & Stakeholdering				$757,703	$757,703
Process and Market Evaluation				$541,216	$541,216
Research and Development Costs				**$3,429,271**	**$3,429,271**
Research Innovation Fund				$2,760,202	$2,760,202
Market Data				$669,069	$669,069
Portfolio Subtotal				**$19,483,779**	**$19,483,779**
Total	**$103,362,593**	**$11,646,977**	**$15,956,701**	**$31,947,246**	**$162,913,517**

1. The Building Beyond Code and Low Carbon Transition budget to be reassessed at the mid-point assessment.

Table 8: 2027 DSM Plan Budget

2027 DSM Budget	Incentive Costs	Promotion Costs	Delivery Costs	Admin Costs	2027 Total
Residential Program	**$35,202,751**	**$3,610,006**	**$3,795,652**	**$1,710,487**	**$44,318,896**
Residential Whole Home	$28,336,117	$1,855,827	$3,113,330		$33,305,274
Residential Single Measure	$3,851,113	$870,914	$276,020		$4,998,048
Residential Smart Home	$3,015,521	$883,265	$406,302		$4,305,087
Low Income Program	**$16,902,593**	**$3,621,385**	**$2,763,514**	**$1,595,118**	**$24,882,610**
Home Winterproofing	$10,295,830	$2,704,998	$2,559,259		$15,560,086
Affordable Housing Multi-Residential	$6,606,763	$916,388	$204,255		$7,727,406
Commercial Program	**$19,409,388**	**$1,334,723**	**$2,457,080**	**$3,993,582**	**$27,194,773**
Commercial Custom	$11,846,787	$670,729	$267,065		$12,784,581
Prescriptive Downstream	$2,316,437	$143,972	$176,653		$2,637,062
Direct Install	$4,682,994	$299,206	$176,653		$5,158,853
Prescriptive Midstream	$563,170	$220,817	$1,836,709		$2,620,696
Industrial Program	**$14,573,867**	**$441,632**	**$0**	**$4,282,225**	**$19,297,724**
Industrial Custom	$14,573,867	$441,632	$0		$15,015,499
Large Volume Program	**$2,704,998**	**$55,204**	**$0**	**$234,481**	**$2,994,683**
Direct Access	$2,704,998	$55,204	$0		$2,760,202
Energy Performance Program	**$676,520**	**$31,836**	**$477,544**	**$111,680**	**$1,297,580**
Whole Building Pay For Performance (P4P)	$676,520	$31,836	$477,544		$1,185,900
Building Beyond Code Program[1]	**$30,614,958 to be reassessed**				
Residential Savings By Design					
Commercial Savings By Design					
Affordable Housing Savings By Design					
Commercial Air Tightness Testing					
Low Carbon Transition Program[1]					
Residential Low Carbon					
Commercial Low Carbon					
Program Subtotal	**$108,120,065**	**$12,349,387**	**$17,419,037**	**$12,712,736**	**$150,601,225**
Administration Costs				**$12,180,092**	**$12,180,092**
Portfolio Administration				$9,276,360	$9,276,360
System Maintenance & Improvements				$1,104,081	$1,104,081
Municipal Engagement				$1,799,652	$1,799,652
Evaluation and Regulatory Costs				**$4,195,507**	**$4,195,507**
EM&V				$2,870,610	$2,870,610
Regulatory & Stakeholdering				$772,857	$772,857
Process and Market Evaluation				$552,040	$552,040
Research and Development Costs				**$3,497,856**	**$3,497,856**
Research Innovation Fund				$2,815,406	$2,815,406
Market Data				$682,450	$682,450
Portfolio Subtotal				**$19,873,455**	**$19,873,455**
Total	**$108,120,065**	**$12,349,387**	**$17,419,037**	**$32,586,192**	**$170,474,680**

1. The Building Beyond Code and Low Carbon Transition budget to be reassessed at the mid-point assessment.

15. Some items of note regarding the DSM Plan budgets are as follows:

- The Low Income and Low Carbon Transition program budgets are each ring fenced (i.e. no program funds budgeted for each of these programs will be transferred to any other program).
- The forecast budget split between the Large and Small customer metrics included in the Commercial Scorecard to be used for the Target Adjustment Mechanism (outlined in Exhibit D, Tab 1, Schedule 2) are detailed in Table 9 below:

Table 9: Large/Small Commercial Forecast

Forecast for the Large-Small Commercial Scorecard[1]						
Commercial Metric	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Large (>100,000 m3) Cust. Annual Gas Savings (m^3)[2]	$11,708,263	$11,939,228	$12,108,773	$12,350,948	$12,597,967	$12,849,926
Small (<100,000 m3) Cust. Annual Gas Savings (m^3)[2]	$9,392,881	$9,579,939	$9,754,228	$9,949,312	$10,148,299	$10,351,265
Subtotal	**$21,101,144**	**$21,519,167**	**$21,863,001**	**$22,300,261**	**$22,746,266**	**$23,201,191**

1. Includes Incentive, Promotion and Delivery Cost Categories.
2. Large commercial customers have a 3 year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers are below 100,000 m3/yr.

- The Low Carbon Transition program is being delivered with a three-year view, based on three-year targets utilizing a three-year budget, therefore budget amounts included in each of the annual budgets are provided to illustrate the portion of each year's budget that is allocated to the program. Due to challenges with forecasting exact timing within the three-year cycle and not wanting to limit early adoption of deep carbon savings equipment, the program will operate on a three-year cycle, utilizing the entire budget as needed over the three-year period. The total budget would be capped for the period and the Company would not access any of the available 15% DSMVA overspend for this program. If appropriate due to higher uptake in the market, the Company may put forward a separate application for increased funding. At the end of each annual period, the amount spent in that year will be accounted for and included in the annual Deferral and Clearance process. Details regarding the requirements for this program for the second three-year period of the term will be proposed at the mid-point assessment. The Low Carbon Transition program three-year budget is summarized in Table 10 below:

Table 10: Low Carbon Transition Program Total Three-Year Budget

Low Carbon Transition Program Budget	**2022**	**2023**	**2024**	**Total**
Residential Low Carbon	$2,061,539	$2,701,194	$5,275,586	$10,038,319
Commercial Low Carbon	$829,167	$1,685,967	$1,999,567	$4,514,701
Program Level Admin Costs	$199,687	$203,680	$207,754	$611,121
Total	**$3,090,393**	**$4,590,841**	**$7,482,907**	**$15,164,141**

Staffing and DSM compensation costs

16. The purpose of this section of evidence is to demonstrate how Enbridge Gas is responding to the direction received from the OEB in the DSM Letter and to explain and support the staffing and salary costs that will be incurred to successfully deliver the DSM Plan. The Company submits that it is appropriate to start by referencing the evidence in respect of these costs that was filed as part of the 2021 DSM Plan proceeding (EB-2019-0271) as this provides a relevant reference point and summary. This evidence remains relevant as this Application is being filed less than 10 months after the OEB's Decision in respect of the 2021 DSM Plan.

17. It should be noted that Union and EGD (the legacy utilities) did not account for DSM Plan costs in a like manner, particularly with respect to the allocation of DSM related compensation costs. Enbridge Gas has now aligned budgeting methodologies, and this Application and the budget details provided are a reflection of this integrated

approach. The Company has directly allocated budgeted DSM compensation costs to the program level where the cost can be directly tied to those activities. This approach is most similar to the methodology utilized by legacy Union Gas. Where the costs cannot be directly allocated to the program level, they have been included in the portfolio costs.

18. Table 11 shows the overall allocation of headcount within the budget at a program and portfolio level. It should be noted that the Company has allocated resources to the program level and not to any individual offering level, as many resources delivering DSM are supporting a sector or program type and therefore any attempts to budget and allocate staffing resources to a particular offering would not be practical nor accurate. To the extent that resources are redirected by the Company as between offerings or programs as permitted by the Proposed Framework to optimize DSM activities, the allocation of FTE's to the various programs at any given point in time may change.

Table 11: 2022 DSM Plan Headcount

DSM Budget - Headcount	2022 FTE[1]	2023 FTE[1]	2024 FTE[1]
Residential Program	15.0	15.0	15.0
Low Income Program	15.0	15.0	15.0
Commercial Program	33.5	33.5	33.5
Industrial Program	35.0	35.0	35.0
Large Volume Program	2.0	2.0	2.0
Energy Performance Program	0.5	0.5	0.5
Building Beyond Code Program	5.0	5.0	5.0
Low Carbon Transition Program	2.0	2.0	2.0
Program Subtotal	108.0	108.0	108.0
Portfolio Subtotal	61.0	61.0	61.0
Total	169.0	169.0	169.0

1. "FTE": Full Time Equivalent Staff

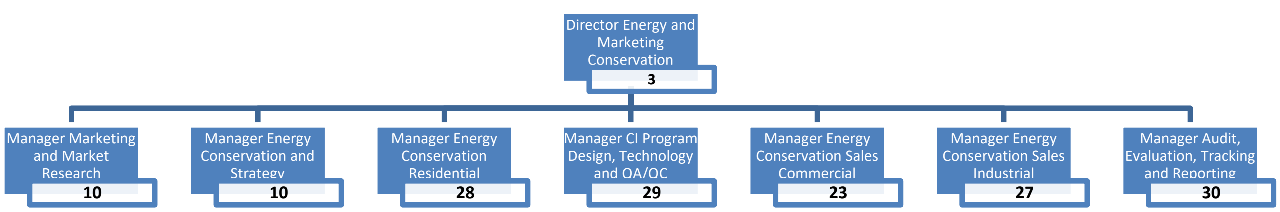
19. As can been seen from Table 11 above, Enbridge Gas is proposing a flat headcount for the first half of the DSM Plan. While this table notes that the Company forecasts a flat headcount for the first three years, it is important to understand that for the balance of the term of the DSM Plan, Enbridge Gas will be required to manage within the budgets approved by the OEB.

20. During the 2021 DSM Plan proceeding, OEB Staff and interested parties sought details regarding staffing levels and associated historical costs particularly given the merger of the legacy utilities. The Company provided the following references in response at Exhibit I.STAFF.4 (EB-2019-0271):

> Enbridge Gas has integrated the organizational structure across the entire DSM portfolio (see Figure 1 below). The integration was completed in 2019 and is expected to remain through 2021.

Figure 1

Energy Conservation and Marketing Organizational Structure



NOTES:
Numbers in Figure 1 represent headcount which can and will vary compared with Full Time Equivalent (“FTE”) numbers due to partially effective headcount in normal course of business such as vacancy lags, maternity leave, etc. Please see Attachment 1 for numeric FTE information by rate zone.

> As seen in Attachment 1, there has been a permanent reduction of greater than 20 FTE across the Union and EGD rates zones. Reductions are concentrated in management roles, as most front-line roles are required to manage the delivery, tracking and reporting of OEB-approved 2015-2020 DSM Plans until a new DSM Framework and corresponding multi-year plan is approved.

The Company further stated in the same response:

> As discussed in the response at Exhibit I.PP.4, resources have been increasingly engaged in Municipal Energy Plans, as numerous Municipalities have declared Climate Change Emergencies and have requested utility support in relation to both data collection on energy use and for technical and policy support (supporting task forces and/or advisory panels) to help drive energy conservation. Additionally, the federal government has made several announcements, as noted by some intervenors, related to energy conservation as part of the government's climate initiatives. Accordingly, resources have been re-allocated to promote synergies and alignment in energy conservation programming aimed at optimizing customer participation in incentive programs. These resource draws were not originally in the 2015-2020 DSM Plans, but do fit within the broader objectives of the DSM Framework and are consistent with the Board's objective to promote energy conservation and energy efficiency.

21. Enbridge Gas also responded to requests for details regarding historical headcount and costs at Exhibit I.STAFF.4, Attachment 1 (EB-2019-0271). A copy of this response is attached to this Application at Exhibit D, Tab 1, Schedule 1, Attachment 1. This response compares the 2021 Proposed FTE and DSM Compensation totals to actual FTE and compensation totals for each of the 2015-2020 years for each of the legacy utilities. This response confirms that there was a material decrease in the aggregate number of FTE in 2019 as a result of the merger with only modest increases due to program growth in the following year. It is from this base that the salary budget for 2022 was determined.

22. Table 12 below shows the 2021 approved budgeted headcount with the proposed 2022 totals with historical values repeated from the 2021 DSM Plan proceeding response[10]. This shows a proposed increase of approximately 10 FTEs and $573,384 in DSM Compensation for 2022 relative to the 2021 approved budget.

[10] Figures taken from EB-2019-0271, Exhibit I.STAFF.4, Attachment 1 (April 6, 2020).

Table 12: DSM FTE and Compensation Cost, 2021 approved and 2022 proposed

Line No.	Particulars	Forecast 2021	Proposed 2022	2022/2021 change
1	FTE	159.2	169	9.8
2	Compensation Cost charged to DSM	$ 16,470,664	$ 17,044,048	$ 573,384
3	Average Compensation/FTE	$ 103,459	$ 100,852	$ (2,607)

23. Table 13 illustrates how the proposed headcount increases are allocated within the program and portfolio budgets.

Table 13: Programs and Portfolio Administration

Category	Total 2022 FTE	Incremental FTE vs. 2021	Total 2022 DSM compensation
Programs Admin	108	+ 9	$10,813,193
Portfolio Admin	61	+ 1	$6,230,855
Total	169	+ 10	$17,044,048

24. As identified in the 2021 DSM Plan hearing, Enbridge Gas had achieved a permanent reduction of greater than 20 staff positions in the course of the utility integration in 2019, resulting in 159 FTEs supporting DSM. This level of resources has been maintained through 2021. During this period the Company has reallocated existing resources to new activities that have emerged that were not contemplated in the 2015-2020 DSM plan, including support for municipal energy planning activities that will facilitate the development and implementation of GHG reduction and energy conservation activities by Ontario's municipalities.

25. Moving forward in 2022 and beyond, Enbridge continues to see an evolution in the types of activities, programs and support that will be necessary to meet the primary and secondary objectives outlined by the OEB for DSM programming. Resources will continue to be trained and reallocated, as appropriate, to those activities that are adding the most value to customers.

26. The DSM Letter clearly indicated an expectation, consistent with Ontario Government goals and direction, for modest DSM budget increases. In development of a DSM Plan that addresses the guidance received from the OEB, it was clear that modest increases would be required not only to program budgets, but also for Company resources to continue to deliver the expanded DSM Portfolio. Ten additional FTE's have been identified as being necessary to address the OEB guidance, Proposed Framework guiding principles and the Government's Environmental Plan[11] and its support for continued and expanded DSM. More specifically, the Company believes that the following additional staffing resources are required to support and successfully deliver the DSM Plan, achieve the Ontario Government's overall goals for DSM programming and satisfy the guiding principles noted below.

27. *Guiding Principle: DSM plans should be designed to provide opportunities for a broad spectrum of consumer groups and customer needs to encourage widespread customer participation over time and "ensure all segments of the market are reached.*[12]

---

[11] Preserving and Protecting our Environment for Future Generations – A Made-in-Ontario Environment Plan, Ministry of Environment, Conservation and Parks (November 29, 2018). https://prod-environmental-registry.s3.amazonaws.com/2018-11/EnvironmentPlan.pdf
[12] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, p. 6.

- To reach smaller commercial customers and increase penetration in the residential and low income markets Enbridge Gas is proposing to increase the number and reach of the direct install programs that are delivered through industry trade channels for some prescriptive measures. These channels will focus on hard-to-reach market segments to broaden participation in DSM programs. Additional details regarding these delivery channels are found in the commercial (Exhibit E, Tab 1, Schedule 4) and residential (Exhibit E, Tab 1, Schedule 2) programs.
- Reaching these customers using internal delivery resources would be challenging and therefore requires engagement of industry partners that have direct interaction with end use customers as part of their regular sales processes. Development of these channels will require securing multiple vendors across Ontario, development and delivery of training and support services for the trade allies and tracking and reporting of the results by vendor. Enbridge Gas has estimated this will require one new FTE's in the commercial sector, one in the residential sector and one in affordable housing for a total of three incremental FTE's. The associated costs have been included in the respective program administration costs identified in Table 13.

28. *Guiding Principle: DSM plans should balance the achievement of cost-effective natural gas savings and customer bill impacts.*[13]

- In the DSM Plan several new delivery channels, measures and program approaches have been put forward, including the development of low carbon solutions, assisting municipalities and reaching a greater array of customers. All of these are more costly to pursue than traditional programs and result in a lower cost effectiveness for the portfolio overall. The DSM plan proposes to balance the cost effectiveness of the portfolio by pursuing more commercial and industrial

[13] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, p. 6.

custom projects. The custom programs are the most cost-effective programs in the portfolio. However as outlined in the Commercial and Industrial program section Exhibit E, Tab 1, Schedule 4 and Schedule 5 respectively, the cost effectiveness of these programs has also been declining over time as the average size of individual projects has diminished.

- Enbridge does feel there is potential in both the commercial and industrial markets to reach new participants and has forecast an increase in the number of projects by more than 25% over historical levels. The resources required to support the custom program in these markets is correlated to the number of projects, not the savings attributed to the project and will therefore require incremental resourcing to both work with customers and to provide the quality control and assurance through project evaluation. Four incremental resources are required to achieve the targets proposed. Three are customer facing ESA's and one is a program evaluation role. The incremental DSM compensation cost of the 4 FTE's are captured in the commercial and industrial program administration costs identified in Table 13.

29. *Guiding Principle: DSM plans should support innovation, technology development and adoption of lower-carbon alternatives to enable longer term energy efficiency and conservation opportunities, consistent with the advancement of provincial policy goals.*[14]

- The provincial and federal carbon reduction goals are clear. Enbridge Gas needs to play a central role working with industry participants and government agencies to enable a path forward for the reduction of GHG's in the thermal envelope for homeowners and businesses that is both reliable and economic. As described at Exhibit E, Tab 3, Schedule 1, significant time and resources are

[14] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, p. 8.

required to meet aspirational goals and roadmaps for equipment efficiency set out in the Pan Canadian Framework developing new heating options. Leveraging both electric and gas heat pumps will be critical to ensure that the Ontario market is prepared to sell, deliver and service reliable gas heating equipment to consumers that meets future codes and/or standards. This work is going to continue to advance and will require additional time and effort to achieve the objectives set out for 2030. Two resources have been identified to support these efforts. The incremental DSM compensation costs are included in the program administration cost for the Low Carbon Transition Program on Table 13.

30. *Guiding Principle: DSM plans should be designed to provide opportunities for a broad spectrum of consumer groups and customer needs to encourage widespread customer participation over time and "ensure all segments of the market are reached;*[15] *and*

31. *Guiding Principle: Enbridge Gas should not have a disincentive to coordinate DSM efforts with external energy conservation and carbon reduction initiatives.*[16]

- Enbridge serves customers in 340 municipalities in Ontario. Each municipality has a distinct and varying agenda with respect to energy plans, greenhouse gas emissions and the role natural gas will play in their respective communities going forward. Some are very advanced in their thinking and have dedicated teams developing plans to meet 2030 targets and beyond, whereas others lack resources to address motions that are passed by Council supportive of GHG reduction initiatives. More details can be found in the Municipal Engagement section below.

[15] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, p. 6.
[16] Ibid, p. 8.

- Over the past few years, many Municipalities have reached out to Enbridge looking for support to develop their community energy plans, sit on committees, and attend Council meetings. Recognizing that this was an emerging trend that would continue to grow, a new team was established to focus on energy plan development and implementation with Municipalities. Existing team members were moved from other areas of Energy Conservation to staff this new group. As we start down this exciting path, it is clear that in addition to an external facing team, a significant amount of data analysis and analytics will be required at the municipal level in order to work with communities to determine how to best implement the ideas and plans that have created. This is a completely new way of looking at data for Enbridge as we have historically focused on the customer location in DSM and not at the community level. One incremental FTE has been identified to support the additional data analysis and analytics required. The incremental DSM compensation costs are included in the Portfolio Administration in Table 13.

HISTORICAL FTE'S AND DSM COMPENSATION

Line No.	Particulars	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Forecast	2021 Proposed
1	Union Rate Zones							
2	FTE	88.2	92.7	97.4	92.3	80.8	82.9	82.9
3	DSM Compensation Actual/Forecast	$ 7,020,951	$ 8,269,211	$ 9,809,128	$ 9,768,623	$ 8,737,116	$ 8,821,664	$ 9,086,314
4	Average cost/FTE	$ 79,603	$ 89,204	$ 100,710	$ 105,836	$ 108,133	$ 106,413	$ 109,606
5	EGD Rate Zone							
6	FTE	67	70	81	88	69	76.3	76.3
7	DSM Compensation Actual/Forecast	$ 7,068,550	$ 7,054,258	$ 7,162,408	$ 7,456,297	$ 6,683,478	$ 7,169,272	$ 7,384,350
8	Average cost/FTE	$ 105,501	$ 100,775	$ 88,425	$ 84,731	$ 96,862	$ 93,962	$ 96,780

ENBRIDGE GAS DSM PLAN PROPOSAL

Shareholder Incentives

1. As outlined in the Proposed Framework, the shareholder incentive structure will encompass four separate and distinct performance incentive components to address the objectives and priorities indicated by the OEB. The infographic included on the following page is intended to provide a simple illustration of the components of the overall shareholder incentives ("DSMI"). A detailed explanation of the shareholder incentives follows the infographic.

Enbridge Gas Shareholder Incentives

Shareholder incentives (DSMI) align the Company with ratepayer interests and support multiple objectives achieved through four performance mechanisms.

Annual scorecard achievement

Earned on achievement against annual targets.

Distinct annual resource acquisition scorecards

Residential Program
Low Income Program
Commercial Program
Industrial Program
Large Volume Program

Annual targets escalated by target adjustment mechanism

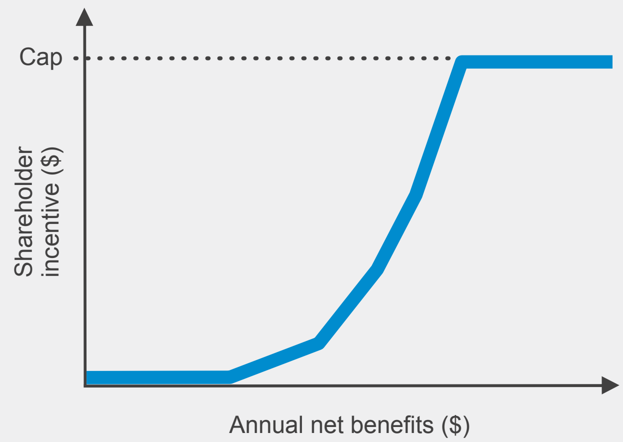
Multi year program scorecards

Building Beyond Code Program
Energy Performance Program

Fixed annual targets

Annual net benefits

Earned as a percentage of net benefits.



Long term scorecard achievement

Earned on achievement against three-year targets.

Low Carbon Transition Program

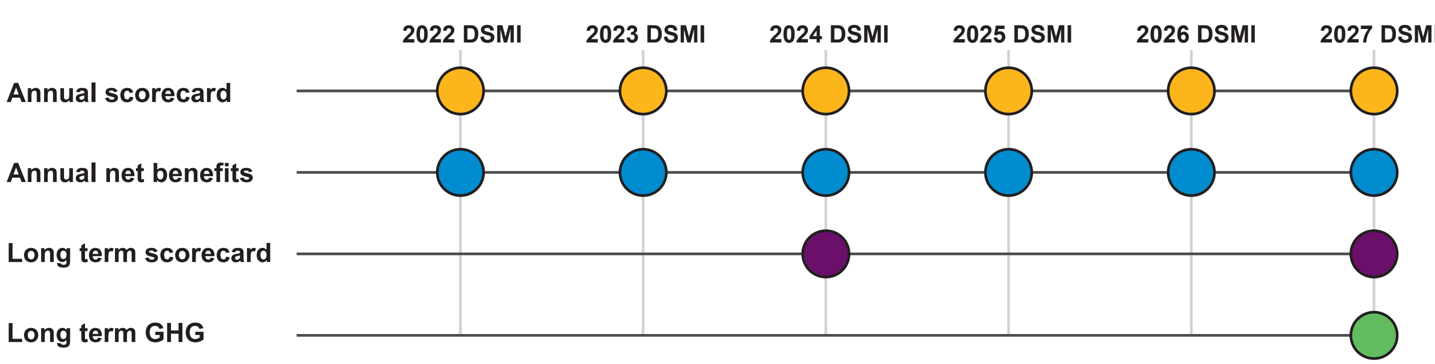
Fixed three-year targets

Long term GHG achievement

One time earning opportunity, assessed at the end of six-year term.

Gross GHG long term stretch target
Incentive conditional on achieving/exceeding target.

Shareholder incentive schedule



Distribution of the Maximum Shareholder Incentive Amount

2. As outlined in the Proposed Framework, the maximum annual shareholder incentive achievable for Enbridge Gas should be based on the total amount approved for the utilities in the 2015-2020 Framework and again in the 2021 DSM Plan, or $20.9 million. This maximum annual shareholder incentive is divided between annual shareholder incentives and long term shareholder incentives, as follows:

Annual Maximum Shareholder Incentives

3. The annual maximum shareholder incentive of $19.5 million (the $20.9 million annual base less $1.4 million for long term incentives described below) would be escalated for inflation (assumed to be 2%) over the course of the six-year term, as illustrated in Table 1 below, and would be assessed annually and allocated towards performance relative to i) annual scorecards; and, ii) achievement of overall net benefits.

Table 1: Maximum Annual Shareholder Incentive

	2022	2023	2024	2025	2026	2027
Annual Scorecards Maximum Incentive	$13,000,000	$13,260,000	$13,525,200	$13,795,704	$14,071,618	$14,353,050
Annual Net Benefits Maximum Incentive	$6,500,000	$6,630,000	$6,762,600	$6,897,852	$7,035,809	$7,176,525
Total Annual Maximum DSMI	**$19,500,000**	**$19,890,000**	**$20,287,800**	**$20,693,556**	**$21,107,427**	**$21,529,576**

Long Term Shareholder Incentives

4. Enbridge Gas proposes allocating $1.4 million of the maximum annual amount (for example of $20.9 million for 2022) each year, or $8.4 million over the six-year term, toward the two longer term objectives outlined below, specifically the Low Carbon Transition Program and the Long Term GHG Reduction target. Table 2 below illustrates how the $2.4M and $6M for the Low Carbon Transition Scorecard and Long Term GHG Reduction Target accrues each year.

Table 2: Long Term Shareholder Incentive Amounts

	2022	2023	2024	2025	2026	2027	Six-Year Total
Low Carbon Transition Scorecard [1]	*$400,000*	*$400,000*	*$400,000*	*$400,000*	*$400,000*	*$400,000*	**$2,400,000**
Long Term GHG Reduction Target [2]	*$1,000,000*	*$1,000,000*	*$1,000,000*	*$1,000,000*	*$1,000,000*	*$1,000,000*	**$6,000,000**
Total Long Term Incentives	*$1,400,000*	*$1,400,000*	*$1,400,000*	*$1,400,000*	*$1,400,000*	*$1,400,000*	**$8,400,000**

1. The achievement of the Low Carbon Transition Scorecard Incentive is determined at the end of the 2024 program year and at the end of the 2027 program year. Re-assessed at the mid-point assessment.
2. The achievement of the Long Term GHG Reduction Target incentive is determined at the end of the 2027 program year.

Annual Scorecards Incentive

5. The Annual Scorecards Incentive is a scorecard approach whereby Enbridge Gas is assessed annually in its performance against a set of independent scorecards comprised of defined annual metrics. These metrics would relate to program activities, including net annual natural gas savings (m^3) as appropriate, to align with the objectives of the program offerings. As described in Section 5.1, of the Proposed Framework,[1] targets at 50%, 100% and 150% will be established for each scorecard. To achieve the maximum shareholder incentive, Enbridge Gas will be required to meet a weighted score of 150% on each of its scorecards. No shareholder incentive will be paid on a given scorecard for achieving a scorecard weighted result of less than 50%. For a given scorecard, one-half (50%) of the maximum shareholder incentive tied to that scorecard will be awarded for a weighted scorecard performance of 100% on that scorecard. Results will be linearly interpolated between scorecard weighted results between 50% and 150% achievement. Where more than one metric is defined on a given scorecard, the minimum achievement for each individual metric is 0% and the maximum achievement is 200%. Scorecard DSMI achievement is illustrated in Table 3 below:

[1] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 5.1.

Table 3: Scorecard DSMI Achievement

DSMI achievement for each scorecard less than **50%** weighted scorecard achievement	DSMI achievement for each scorecard at **100%** weighted scorecard achievement	DSMI achievement for each scorecard at **150%** weighted scorecard achievement
0	50% of maximum shareholder incentive	100% of maximum shareholder incentive

6. As laid out in Table 3 above, two-thirds of the maximum annual incentive, or for example, $13 million in 2022, would be allocated to achievement relative to the annual scorecards. Enbridge Gas does not believe the maximum shareholder incentive should be allocated in proportion to budget. Doing so does not provide an appropriate weighting to reflect a reasonable and balanced approach to all programs and all sectors, nor all the OEB's objectives for Enbridge Gas in delivering DSM to all customers. Instead, Enbridge Gas has proposed defined allocations of the maximum annual incentive for each of the annual scorecards to provide a clear well-balanced inducement for the Company to focus efforts across all sectors and proposed programs. The proposed annual scorecard maximum shareholder incentive allocation is labelled as 'DSMI Allocation' in Table 4 below which illustrates the proposed weighting across the 2022 Annual Scorecards. The proposed targets corresponding to these scorecards are detailed in Exhibit D, Tab 1, Schedule 3.

7. DSMI is assessed independently on each scorecard, based on the achievement of each program and its related scorecard for:
    - Residential Program
    - Low Income Program
    - Commercial Program
    - Industrial Program
    - Large Volume Program
    - Energy Performance Program
    - Building Beyond Code Program

Table 4: 2022 Annual Scorecards

2022 Annual Scorecards	Offering(s)	Metric	Metric Weight	DSMI Allocation	DSMI below 50% Score	DSMI at 100% Score	DSMI at 150% Score
Residential Program	Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,430,000	$2,860,000
Low Income Program	Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	22.0%	$0	$1,430,000	$2,860,000
	Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%				
Commercial Program	Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [1]	50%	22.0%	$0	$1,430,000	$2,860,000
		Small Customer Net Annual Gas Savings (m^3) [1]	50%				
Industrial Program	Industrial Custom	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,430,000	$2,860,000
Large Volume Program	Direct Access	Net Annual Gas Savings (m^3)	100%	3.0%	$0	$195,000	$390,000
Energy Performance Program	Whole Building Pay For Performance (P4P)	Number of Participants (P4P)[2]	100%	1.0%	$0	$65,000	$130,000
		Net Annual Gas Savings (m^3) [2]	0%	0.0%	$0	$0	$0
Building Beyond Code Program	Residential Savings by Design	Number of Energy Star Homes[3]	30%	8.0%	$0	$520,000	$1,040,000
		Number of Net Zero Ready Homes[3]	0%				
	Commercial Savings by Design	Number of Participants	30%				
	Affordable Housing Savings By Design	Number of Participants	30%				
	Commercial Air Tightness Testing	Number of Participants[4]	0%				
		Number of Qualified Agents[4]	10%				
			Total	**100%**	**$0**	**$6,500,000**	**$13,000,000**

1. Large commercial customers have a three year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers have a three year average annual consumption below 100,000 m3/yr.

2. Whole Building P4P metrics are weighted 50/50% except for year 1 (2022) which is 100/0% as no savings measured until year 2.

3. Residential SBD metrics are weighted 50/50% except for year 1 (2022) which is 100/0% as no Net Zero building until year 2.

4. Commercial Air Tightness metrics are weighted 50/50% except for year 1 (2022) which is 100/0% given no participants until year 2.

Table 5: 2023 Annual Scorecards

2023 Annual Scorecard	Offering(s)	Metric	Metric Weight	DSMI Allocation	DSMI below 50% Score	DSMI at 100% Score	DSMI at 150% Score
Residential Program	Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,458,600	$2,917,200
Low Income Program	Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	22.0%	$0	$1,458,600	$2,917,200
	Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%				
Commercial Program	Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [1]	50%	22.0%	$0	$1,458,600	$2,917,200
		Small Customer Net Annual Gas Savings (m^3) [1]	50%				
Industrial Program	Industrial Custom	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,458,600	$2,917,200
Large Volume Program	Direct Access	Net Annual Gas Savings (m^3)	100%	3.0%	$0	$198,900	$397,800
Energy Performance Program	Whole Building Pay For Performance (P4P)	Number of Participants (P4P)	50%	1.0%	$0	$66,300	$132,600
		Net Annual Gas Savings (m^3)	50%				
Building Beyond Code Program	Residential Savings by Design	Number of Energy Star Homes	15%	8.0%	$0	$530,400	$1,060,800
	Residential Savings by Design	Number of Net Zero Ready Homes	15%				
	Commercial Savings by Design	Number of Participants	30%				
	Affordable Housing Savings By Design	Number of Participants	30%				
	Commercial Air Tightness Testing	Number of Participants	5%				
	Commercial Air Tightness Testing	Number of Qualified Agents	5%				
			Total	**100%**	**$0**	**$6,630,000**	**$13,260,000**

1. Large commercial customers have a three year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers have a three year average annual consumption below 100,000 m3/yr.

Table 6: 2024 Annual Scorecards

2024 Annual Scorecard	Offering(s)	Metric	Metric Weight	DSMI Allocation	DSMI below 50% Score	DSMI at 100% Score	DSMI at 150% Score
Residential Program	Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,487,772	$2,975,544
Low Income Program	Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	22.0%	$0	$1,487,772	$2,975,544
	Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%				
Commercial Program	Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [1]	50%	22.0%	$0	$1,487,772	$2,975,544
		Small Customer Net Annual Gas Savings (m^3) [1]	50%				
Industrial Program	Industrial Custom	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,487,772	$2,975,544
Large Volume Program	Direct Access	Net Annual Gas Savings (m^3)	100%	3.0%	$0	$202,878	$405,756
Energy Performance Program	Whole Building Pay For Performance (P4P)	Number of Participants (P4P)	50%	1.0%	$0	$67,626	$135,252
		Net Annual Gas Savings (m^3)	50%				
Building Beyond Code Program	Residential Savings by Design	Number of Energy Star Homes	15%	8.0%	$0	$541,008	$1,082,016
	Residential Savings by Design	Number of Net Zero Ready Homes	15%				
	Commercial Savings by Design	Number of Participants	30%				
	Affordable Housing Savings By Design	Number of Participants	30%				
	Commercial Air Tightness Testing	Number of Participants	5%				
	Commercial Air Tightness Testing	Number of Qualified Agents	5%				
		Total		**100%**	**$0**	**$6,762,600**	**$13,525,200**

1. Large commercial customers have a three year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers have a three year average annual consumption below 100,000 m3/yr.

Table 7: 2025 Annual Scorecards

2025 Annual Scorecard	Offering(s)	Metric	Metric Weight	DSMI Allocation	DSMI below 50% Score	DSMI at 100% Score	DSMI at 150% Score
Residential Program	Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,517,527	$3,035,055
Low Income Program	Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	22.0%	$0	$1,517,527	$3,035,055
	Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%				
Commercial Program	Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [1]	50%	22.0%	$0	$1,517,527	$3,035,055
		Small Customer Net Annual Gas Savings (m^3) [1]	50%				
Industrial Program	Industrial Custom	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,517,527	$3,035,055
Large Volume Program	Direct Access	Net Annual Gas Savings (m^3)	100%	3.0%	$0	$206,936	$413,871
Energy Performance Program[2]	Whole Building Pay For Performance (P4P)	Number of Participants (P4P)	50%	1.0%	$0	$68,979	$137,957
		Net Annual Gas Savings (m^3)	50%				
Building Beyond Code Program[2]	Residential Savings by Design	Number of Energy Star Homes	15%	8.0%	$0	$551,828	$1,103,656
	Residential Savings by Design	Number of Net Zero Ready Homes	15%				
	Commercial Savings by Design	Number of Participants	30%				
	Affordable Housing Savings By Design	Number of Participants	30%				
	Commercial Air Tightness Testing	Number of Participants	5%				
	Commercial Air Tightness Testing	Number of Qualified Agents	5%				
		Total		**100%**	**$0**	**$6,897,852**	**$13,795,704**

1. Large commercial customers have a three year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers have a three year average annual consumption below 100,000 m3/yr.

2. Energy Performance and Building Beyond Code Programs to be reassessed at the mid-point assessment.

Table 8: 2026 Annual Scorecards

2026 Annual Scorecard	Offering(s)	Metric	Metric Weight	DSMI Allocation	DSMI below 50% Score	DSMI at 100% Score	DSMI at 150% Score
Residential Program	Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,547,878	$3,095,756
Low Income Program	Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	22.0%	$0	$1,547,878	$3,095,756
	Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%				
Commercial Program	Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [1]	50%	22.0%	$0	$1,547,878	$3,095,756
		Small Customer Net Annual Gas Savings (m^3) [1]	50%				
Industrial Program	Industrial Custom	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,547,878	$3,095,756
Large Volume Program	Direct Access	Net Annual Gas Savings (m^3)	100%	3.0%	$0	$211,074	$422,149
Energy Performance Program[2]	Whole Building Pay For Performance (P4P)	Number of Participants (P4P)	50%	1.0%	$0	$70,358	$140,716
		Net Annual Gas Savings (m^3)	50%				
Building Beyond Code Program[2]	Residential Savings by Design	Number of Energy Star Homes	15%	8.0%	$0	$562,865	$1,125,729
	Residential Savings by Design	Number of Net Zero Ready Homes	15%				
	Commercial Savings by Design	Number of Participants	30%				
	Affordable Housing Savings By Design	Number of Participants	30%				
	Commercial Air Tightness Testing	Number of Participants	5%				
	Commercial Air Tightness Testing	Number of Qualified Agents	5%				
			Total	**100%**	**$0**	**$7,035,809**	**$14,071,618**

1. Large commercial customers have a three year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers have a three year average annual consumption below 100,000 m3/yr.

2. Energy Performance and Building Beyond Code Programs to be reassessed at the mid-point assessment.

Table 9: 2027 Annual Scorecards

2027 Annual Scorecard	Offering(s)	Metric	Metric Weight	DSMI Allocation	DSMI below 50% Score	DSMI at 100% Score	DSMI at 150% Score
Residential Program	Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,547,878	$3,095,756
Low Income Program	Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	22.0%	$0	$1,547,878	$3,095,756
	Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%				
Commercial Program	Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [1]	50%	22.0%	$0	$1,547,878	$3,095,756
		Small Customer Net Annual Gas Savings (m^3) [1]	50%				
Industrial Program	Industrial Custom	Net Annual Gas Savings (m^3)	100%	22.0%	$0	$1,547,878	$3,095,756
Large Volume Program	Direct Access	Net Annual Gas Savings (m^3)	100%	3.0%	$0	$211,074	$422,149
Energy Performance Program[2]	Whole Building Pay For Performance (P4P)	Number of Participants (P4P)	50%	1.0%	$0	$70,358	$140,716
		Net Annual Gas Savings (m^3)	50%				
Building Beyond Code Program[2]	Residential Savings by Design	Number of Energy Star Homes	15%	8.0%	$0	$562,865	$1,125,729
	Residential Savings by Design	Number of Net Zero Ready Homes	15%				
	Commercial Savings by Design	Number of Participants	30%				
	Affordable Housing Savings By Design	Number of Participants	30%				
	Commercial Air Tightness Testing	Number of Participants	5%				
	Commercial Air Tightness Testing	Number of Qualified Agents	5%				
			Total	**100%**	**$0**	**$7,176,525**	**$14,353,050**

1. Large commercial customers have a three year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers have a three year average annual consumption below 100,000 m3/yr.

2. Energy Performance and Building Beyond Code Programs to be reassessed at the mid-point assessment.

Annual Net Benefits Shared Savings

8. In response to stakeholder feedback at the 2015-2020 DSM Framework Mid-Term Review, and continued input through the Post-2020 DSM Framework consultation, a shared savings mechanism where Enbridge Gas can annually share a small portion of the overall economic benefits produced by the portfolio of DSM programs that accrue to ratepayers based on net benefits calculated by way of the Total Resource-Plus Cost Test has been introduced. This annual net benefit shared savings would be earned as follows:[2]

- 0% shared savings for the first $100 million in net benefits
- Increasing % shared savings, up to an annual cap, for incremental achievement of net benefits, subject to the schedule in Table 10:

Table 10: Net Benefits Shared Savings Schedule

Net Benefit Range	Percentage of Net Benefits Shared
$0 - $100 million	0.00%
$100 - $200 million	1.00%
$200 - $300 million	1.25%
$300 - $400 million	1.50%
$400 - $500 million	2.00%
$500+ million	2.50%

9. The remaining one-third of the annual incentive would be allocated to the achievement of net benefits on the overall DSM portfolio annually. Table 11 below provides an illustration of how the annual net benefits shared savings would be determined for the 2022 program year based on the forecast net benefits.

[2] This approach and the proposed earning schedule and thresholds presume Enbridge Gas will deliver a full range of DSM programming across all customer sectors including Residential, Low Income, Commercial, Industrial and Large Volume.

10. The maximum capped shared savings earning opportunity for 2022 is $6.5 million and would be escalated for inflation (assumed to be 2% annually) each year thereafter as illustrated in Table 1 above.

Table 11: Net Benefits Shared Savings Illustration

Net Benefits	2022 Forecast		
Max Annual Shared Savings	**$6,500,000**		
Forecasted 2022 Net Benefits ($) Result [1]	**$373,867,305**		
Net Benefit Range	**Percentage of Net Benefits Shared**	**Max Annual DSMI By Range**	**Forecasted Calculated Incentive By Range**
$0M - $100M	0.00%	$0	$0
$100M - $200M	1.00%	$1,000,000	$1,000,000
$200M - $300M	1.25%	$1,250,000	$1,250,000
$300M - $400M	1.50%	$1,500,000	$1,108,010
$400M - $500M	2.00%	$2,000,000	$0
$500M+	2.50%	$750,000	$0
	Total	**$6,500,000**	**$3,358,010**

1. The value presented is a forecast of the 2022 Net Benefits and is provided to illustrate the Net Benefits shared savings earning opportunity. (See Table 1 in Exhibit D, Tab 1, Schedule 4 for the TRC-Plus and Net Benefits Analysis for 2022).

Long Term Scorecard Incentive: Low Carbon Transition Program

11. 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. A shareholder incentive linked to the achievement of metrics in this program will be gauged over a three-year period (instead of annually) and again at the end of the six-year term. Similar to the annual scorecards, targets at 50%, 100% and 150% will

be established for the weighted scorecard. The minimum achievement for each metric will be 0% and the maximum achievement will be 200%. To achieve the maximum shareholder incentive designated on this scorecard, at the end of the three-year period, Enbridge Gas will be required to meet the maximum weighted score of 150%. No shareholder incentive will be paid for achieving a scorecard weighted result of less than 50%. One-half (50%) of the maximum shareholder incentive will be awarded for a weighted scorecard performance of 100% on that scorecard. As with the annual scorecards, results will be linearly interpreted between scorecard weighted results between 50% and 150% achievement. Any shareholder incentive achieved relative to this scorecard would be determined at the end of the three-year period. Details pertaining to this shareholder incentive for the second-half of the six-year DSM Plan term will be determined based on Enbridge Gas's proposal at the mid-point assessment.

12. As illustrated in Table 2 above, $2.4 million of the $8.4 million will be allocated to achievement in the Low Carbon Transition program, of which $1.2 million would be assessed at the end of the first three-year period based on achievement of metrics outlined for the Low Carbon Transition program scorecard and the remaining $1.2 million would be assessed at the end of the six-year term. The Low Carbon Transition scorecard, including three-year targets, is illustrated in Table 12 below. The proposed targets corresponding to the Low Carbon Transition scorecard is detailed in Exhibit D, Tab 1, Schedule 3.

Table 12: Long Term Scorecard: Low Carbon Transition Program

2022-2024 Long Term Scorecard	Offering(s)	Metric	Metric Weighting	DSMI below 50% Score	DSMI at 100% Score	DSMI at 150% Score
Low Carbon Transition Program	Residential Low Carbon	Number of Installations (Residential Heat Pumps)	25%	$0	$600,000	$1,200,000
		Number of Contractors Trained (Residential Heat Pumps)	25%			
	Commercial Low Carbon	Number of Installations (Commercial Heat Pumps)	25%			
		Number of Engineers Trained (Commercial Heat Pumps)	25%			

1. Low Carbon Transition Programs for 2025-2027 to be reassessed at the mid-point assessment.

Long Term GHG Reduction Incentive

13. In response to the OEB's DSM letter, calling on "Enbridge Gas to develop a longer-term natural gas savings reduction target, separate from the annual targets, that it will work to achieve by the end of the next multi-year DSM term,"[3] the Company is proposing a Long Term GHG Reduction target to be measured at the end of the six-year term. At that time, Enbridge Gas will have an opportunity to earn the allocated portion of the shareholder incentive if the Company has achieved the six-year GHG reduction target. The proposed target metric is the GHG reductions realized through the summation of annual gross natural gas savings targeted in the first year of the plan multiplied by the six-year term of the DSM Plan with an additional 15% stretch target. No incentive will be earned unless the target is achieved or exceeded.

14. As illustrated in Table 2 above, $6 million of the $8.4 million will be allocated to achievement on the Long Term GHG Reduction target which will be assessed at the end of the six-term year. The Long Term GHG Reduction target is illustrated further

[3] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

in Table 13 and Table 14 below. Table 13 illustrates the determination of the proposed target and Table 14 illustrates how any long term GHG reduction shareholder incentive would/would not be earned by the Company based on three illustrative scenarios.

Table 13: Long Term (Six-Year) GHG Reduction Target

Target Development	
2022 Forecast Portfolio Gross Annual m^3	242,805,492
kg $CO2_e$ / m^3 of Natural Gas	1.874
Year 1 (2022) Gross Annual GHG (tonnes)	455,017
Years	6
Stretch Factor	15%
Long Term (Six-Year) GHG Reduction Target - (tonnes)	**3,139,621**

Table 14: Long Term (Six-Year) GHG Reduction DSMI

Long Term GHG Reduction DSMI Scenario Analysis			
	Achieve Less than 100% Target	Achieve 100% of Target	Achieve Greater than 100% Target
Sum of 2022-2027 Gross Annual GHG Reduction Achievement (tonnes)		3,139,621	
Long Term (Six-Year) GHG DSMI Earned	**$0**	**$6,000,000**	**$6,000,000**

DSM PLAN TARGETS

Annual Scorecard Targets

1. The DSM Plan annual scorecard targets outlined below have been informed by a number of inputs including, but not limited to:
   - Past results in Enbridge Gas's historical level of achievement and program effectiveness including; analysis of participation levels, participating customer investigation, sector analysis, and measure and project breakdown;
   - Consultation with delivery agents, contractors and business partners;
   - Jurisdictional scans to determine how key program elements compared with similar jurisdictions;
   - Internal stakeholdering to gain market insights with Enbridge Gas's own Energy Service Advisors who maintain customer and business partner relationships and well understand the opportunities and barriers in the current marketplace;
   - Market research with customers to further understand opportunities and barriers;
   - Consideration of the OEB's guidance with respect to expectations for modest budget increases and commensurate appropriate rate impacts for customers; and
   - Broad consideration of the Achievable Potential Study (discussed in Exhibit, E, Tab 4, Schedule 7).

2. The annual scorecards are divided into categories:

   i. Scorecards whose base year 2022 targets have been proposed by Enbridge Gas, with consideration for the inputs described above. Subsequent, 2023-2027 year-over-year targets will be determined by way of a formulaic Target Adjustment Mechanism ("TAM"). These scorecards are based on Resource Acquisition type programs who metrics are primarily natural gas savings reductions (m^3). Base year, 2022 targets have been proposed by Enbridge Gas. The TAM methodology will be applied to determine subsequent year targets. The TAM approach is detailed in the Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 5.2. This group includes the following scorecards (program descriptions for these can be found in Exhibit E, Tab 1, Schedules 2 through 6):

- Residential Program Scorecard
- Low Income Program Scorecard
- Commercial Program Scorecard
- Industrial Program Scorecard
- Large Volume Program Scorecard

ii. Scorecards for program offerings which are "multi-year" in nature such that the activities and participant involvement in these offerings spans more than one year. These offerings include a progression of related activities and/or an initial ramp-up in the first year. Due to the nature of these types of program offerings, their metrics are not necessarily amenable to m^3 targets and instead reflect the specific objectives of each program offering. The annual targets for these program offerings cannot easily be addressed utilizing a formulaic TAM calculation. As such, specific targets for each metric specified for these offerings has been proposed by Enbridge Gas. This group includes the following scorecards (program descriptions for these can be found in Exhibit E, Tab 2, Schedule 1 and Schedule 2 respectively):

- Energy Performance Program Scorecard
- Building Beyond Code Program Scorecard

3. The 2022-2027 Annual Scorecard Targets are outlined in Tables 1-6 below inclusive of metrics, weightings and 100% targets, lower (50%) and upper (150%) targets for each scorecard.

Table 1: 2022 Annual Scorecard Targets

Offering(s)	Metric	Metric Weighting	Lower Band (50%) [1]	2022 100% Target	Upper Band (150%) [1]
Residential Program Scorecard					
Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	7,378,637	14,757,274	22,135,910
Low Income Program Scorecard					
Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	1,436,398	2,872,796	4,309,194
Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%	2,507,802	5,015,604	7,523,406
Commercial Program Scorecard					
Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [2]	50%	7,720,641	15,441,281	23,161,922
	Small Customer Net Annual Gas Savings (m^3) [2]	50%	4,457,031	8,914,062	13,371,094
Industrial Program Scorecard					
Industrial Custom	Net Annual Gas Savings (m^3)	100%	25,188,449	50,376,897	75,565,346
Large Volume Program Scorecard					
Direct Access	Net Annual Gas Savings (m^3)	100%	4,650,000	9,300,000	13,950,000
Energy Performance Program Scorecard					
Whole Building Pay For Performance (P4P) [3]	Number of Participants	100%	12.5	25	37.5
	Net Annual Gas Savings (m^3)	0%	0	0	0
Building Beyond Code Program Scorecard					
Residential Savings By Design [4]	Number of Energy Star Homes	30%	150	300	450
	Number of Net Zero Ready Homes	0%	0	0	0
Commercial Savings By Design	Number of Participants	30%	12.5	25	37.5
Affordable Housing Savings By Design	Number of Participants	30%	7.5	15	22.5
Commercial Air Tightness Testing[5]	Number of Participants	0%	0	0	0
	Number of Qualified Agents	10%	3	6	9

1. The calculation of the Upper and Lower Bands of the 100% Targets result in non-integer amounts and the Scorecard Incentive will be calculated based on these precise thresholds.

2. Large commercial customers have a 3 year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers are below 100,000 m3/yr.

3. Whole Building P4P metrics are weighted 50%/50% except for yr. 1 (2022) which is 100%/0% as no energy savings measured until yr. 2

4. Residential SBD metrics are weighted 50%/50% except for year 1 (2022) which is 100%/0% as no Net Zero buildings until year 2

5. Commercial Air Tightness metrics are weighted 50%/50% except for year 1 (2022) which is 100%/0% as no participants until year 2

Consideration of Inputs Impacting 2022 Annual Scorecard Targets:

4. While Enbridge Gas has outlined proposed targets for the 2022 base year of the DSM Plan, it should be noted that there are cases where the 2022 targets will need to be adjusted. While the Proposed Framework (Exhibit C, Tab 1, Schedule 1, Section 9.2) outlines a number of cases where changes to input assumptions and adjustment factors would impact targets in the following year, since 2022 targets are not formulaic based on prior year results, Enbridge Gas is outlining the specific cases below that will necessitate updates to 2022 targets. No other changes to input assumptions would trigger any such update to 2022 proposed targets.

- Input assumption changes made to prescriptive measures through any TRM update process completed in 2021.
  - Since 2022 targets are based on the TRM measure inputs at the time of filing (and prior to the completion of any 2021 TRM updates), if any inputs are updated in the 2021 TRM process, 2022 targets should be updated accordingly.
- Codes and standards changes in 2021 or 2022.
  - As outlined in the Proposed Framework, Section 9.3, changes to codes and standards should be included in both results and targets. This ensures targets are not inappropriately set based on outdated codes and standards. Should a code change occur in 2022, the 2022 targets should be updated accordingly.
- Net-to-Gross ("NTG") adjustment changes if NTG studies are completed as part of the 2021 program year evaluation and verification process.[1]
  - Since 2022 targets are based on the currently best available information for NTG adjustments, if a NTG study is completed on the 2021 program

[1] Or completed in the 2021 program year for NTG studies that would be applied prospectively.

year, the 2022 targets should be updated based on the new NTG adjustments from the study.

- Changes to input assumptions and adjustment factors for new prescriptive measures submitted in the DSM plan.
    - Any input assumptions and adjustment factors for new prescriptive measures included in the DSM Plan that have not been submitted to the Evaluation Contractor ("EC") should be treated as placeholder values. A list of specific measures can be found in Exhibit E, Tab 5, Schedule 1, Table 2. Once Enbridge Gas submits measure research and substantiation documentation to the EC, the 2022 targets should be updated based on those updated values. If further changes are made in 2022 through the TRM update process, the 2022 targets should reflect the newly updated values.
- Any specific changes to input assumptions or adjustment factors included in Enbridge Gas's proposed 2022 targets that are made through the course of this DSM Plan application approval process.

Table 2: 2023 Annual Scorecard Targets

Offering(s)	Metric	Metric Weighting	Lower Band (50%) [1]	2023 100% Target	Upper Band (150%) [1]
Residential Program Scorecard					
Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Low Income Program Scorecard					
Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Commercial Program Scorecard					
Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
	Small Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
Industrial Program Scorecard					
Industrial Custom	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Large Volume Program Scorecard					
Direct Access	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Energy Performance Program Scorecard					
Whole Building Pay For Performance (P4P)	Number of Participants (P4P)	50%	12.5	25	37.5
	Net Annual Gas Savings (m^3)	50%	62,500	125,000	187,500
Building Beyond Code Program Scorecard					
Residential Savings By Design	Number of Energy Star Homes	15%	725	1,450	2,175
	Number of Net Zero Ready Homes	15%	5	10	15
Commercial Savings By Design	Number of Participants	30%	14	28	42
Affordable Housing Savings By Design	Number of Participants	30%	9	18	27
Commercial Air Tightness Testing	Number of Participants	5%	2.5	5	7.5
	Number of Qualified Agents	5%	5	10	15

1. The calculation of the Upper and Lower Bands of the 100% Targets result in non-integer amounts and the Scorecard Incentive will be calculated based on these precise thresholds.

2. Large commercial customers have a 3 year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers are below 100,000 m3/yr.

3. The 100% Target is calculated according to the TAM Methodology set out in the Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 5.2

Table 3: 2024 Annual Scorecard Targets

Offering(s)	Metric	Metric Weighting	Lower Band (50%) [1]	2024 100% Target	Upper Band (150%) [1]
Residential Program Scorecard					
Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Low Income Program Scorecard					
Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Commercial Program Scorecard					
Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
	Small Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
Industrial Program Scorecard					
Industrial Custom	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Large Volume Program Scorecard					
Direct Access	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Energy Performance Program Scorecard					
Whole Building Pay For Performance (P4P)	Number of Participants (P4P)	50%	12.5	25	37.5
	Net Annual Gas Savings (m^3)	50%	125,000	250,000	375,000
Building Beyond Code Program Scorecard					
Residential Savings by Design	Number of Energy Star Homes	15%	1,000	2,000	3,000
	Number of Net Zero Ready Homes	15%	5	10	15
Commercial Savings by Design	Number of Participants	30%	15.5	31	46.5
Affordable Housing Savings By Design	Number of Participants	30%	10.5	21	31.5
Commercial Air Tightness Testing	Number of Participants	5%	3	6	9
	Number of Qualified Agents	5%	5	10	15

1. The calculation of the Upper and Lower Bands of the 100% Targets result in non-integer amounts and the Scorecard Incentive will be calculated based on these precise thresholds.

2. Large commercial customers have a 3 year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers are below 100,000 m3/yr.

3. The 100% Target is calculated according to the TAM Methodology set out in the Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 5.2

Table 4: 2025 Annual Scorecard Targets

Offering(s)	Metric	Metric Weighting	Lower Band (50%) [1]	2025 100% Target	Upper Band (150%) [1]
Residential Program Scorecard					
Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Low Income Program Scorecard					
Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Commercial Program Scorecard					
Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
	Small Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
Industrial Program Scorecard					
Industrial Custom	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Large Volume Program Scorecard					
Direct Access	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Energy Performance Program Scorecard [4]					
Whole Building Pay For Performance (P4P)	Number of Participants (P4P)				
	Net Annual Gas Savings (m^3)				
Building Beyond Code Program Scorecard [4]					
Residential Savings by Design	Number of Energy Star Homes				
	Number of Net Zero Ready Homes				
Commercial Savings by Design	Number of Participants				
Affordable Housing Savings By Design	Number of Participants				
Commercial Air Tightness Testing	Number of Participants				
	Number of Qualified Agents				

1. The calculation of the Upper and Lower Bands of the 100% Targets result in non-integer amounts and the Scorecard Incentive will be calculated based on these precise thresholds.

2. Large commercial customers have a 3 year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers are below 100,000 m3/yr.

3. The 100% Target is calculated according to the TAM Methodology set out in the Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 5.2

4. Energy Performance and Building Beyond Code Programs to be reassessed at the mid-point assessment.

Table 5: 2026 Annual Scorecard Targets

Offering(s)	Metric	Metric Weighting	Lower Band (50%) [1]	2026 100% Target	Upper Band (150%) [1]
Residential Program Scorecard					
Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Low Income Program Scorecard					
Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Commercial Program Scorecard					
Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
	Small Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
Industrial Program Scorecard					
Industrial Custom	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Large Volume Program Scorecard					
Direct Access	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Energy Performance Program Scorecard [4]					
Whole Building Pay For Performance (P4P)	Number of Participants (P4P)				
	Net Annual Gas Savings (m^3)				
Building Beyond Code Program Scorecard [4]					
Residential Savings by Design	Number of Energy Star Homes				
	Number of Net Zero Ready Homes				
Commercial Savings by Design	Number of Participants				
Affordable Housing Savings By Design	Number of Participants				
Commercial Air Tightness Testing	Number of Participants				
	Number of Qualified Agents				

1. The calculation of the Upper and Lower Bands of the 100% Targets result in non-integer amounts and the Scorecard Incentive will be calculated based on these precise thresholds.

2. Large commercial customers have a 3 year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers are below 100,000 m3/yr.

3. The 100% Target is calculated according to the TAM Methodology set out in the Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 5.2

4. Energy Performance and Building Beyond Code Programs to be reassessed at the mid-point assessment.

Table 6: 2027 Annual Scorecard Targets

Offering(s)	Metric	Metric Weighting	Lower Band (50%) [1]	2027 100% Target	Upper Band (150%) [1]
Residential Program Scorecard					
Residential Whole Home Residential Single Measure Residential Smart Home	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Low Income Program Scorecard					
Home Winterproofing	Single Family Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Affordable Housing Multi-Residential	Multi-Residential Net Annual Gas Savings (m^3)	50%	TAM x 50%	TAM [3]	TAM x 150%
Commercial Program Scorecard					
Commercial Custom Prescriptive Downstream Direct Install Prescriptive Midstream	Large Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
	Small Customer Net Annual Gas Savings (m^3) [2]	50%	TAM x 50%	TAM [3]	TAM x 150%
Industrial Program Scorecard					
Industrial Custom	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Large Volume Program Scorecard					
Direct Access	Net Annual Gas Savings (m^3)	100%	TAM x 50%	TAM [3]	TAM x 150%
Energy Performance Program Scorecard [4]					
Whole Building Pay For Performance (P4P)	Number of Participants (P4P)				
	Net Annual Gas Savings (m^3)				
Building Beyond Code Program Scorecard [4]					
Residential Savings by Design	Number of Energy Star Homes				
	Number of Net Zero Ready Homes				
Commercial Savings by Design	Number of Participants				
Affordable Housing Savings By Design	Number of Participants				
Commercial Air Tightness Testing	Number of Participants				
	Number of Qualified Agents				

1. The calculation of the Upper and Lower Bands of the 100% Targets result in non-integer amounts and the Scorecard Incentive will be calculated based on these precise thresholds.

2. Large commercial customers have a 3 year average annual consumption greater than/or equal to 100,000 m3/yr. Small commercial customers are below 100,000 m3/yr.

3. The 100% Target is calculated according to the TAM Methodology set out in the Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 5.2

4. Energy Performance and Building Beyond Code Programs to be reassessed at the mid-point assessment.

Low Carbon Transition Program Targets

4. 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." [2]

Table 7: Low Carbon Transition Program Targets

	Offering(s)	Metric	Metric Weighting	Lower Band (50%) [1]	2022-2024 100% Target	Upper Band (150%)[1]
Low Carbon Transition Program	Residential Low Carbon	Number of Installations (Residential Heat Pumps)	25%	1,361.5	2,723	4,084.5
		Number of Contractors Trained (Residential Heat Pumps)	25%	35	70	105
	Commercial Low Carbon	Number of Installations (Commercial Heat Pumps)	25%	50	100	150
		Number of Engineers Trained (Commercial Heat Pumps)	25%	10	20	30

1. The calculation of the Upper and Lower Bands of the 100% Targets result in non-integer amounts and the Scorecard Incentive will be calculated based on these precise thresholds.

[2] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.

Long Term GHG Reduction Target

5. As described in Exhibit D, Tab 1, Schedule 2 in relation to the shareholder incentive, "[t]he OEB encourages Enbridge Gas to develop a longer-term natural gas savings reduction target, separate from the annual targets, that it will work to achieve by the end of the next multi-year DSM term."[3]

6. Enbridge Gas has therefore proposed a GHG reduction target for the end of the proposed six-year term of the DSM Plan. This 2027 long term GHG reduction goal will provide a representation of the aggregate achievement of natural gas DSM in Ontario over the multi-year framework expressed in terms of associated GHG reductions. The proposed target metric is the GHG reductions realized through the summation of annual gross natural gas savings targeted in the first year of the plan multiplied by the six-year term of the DSM Plan, with an additional 15% stretch target. This calculation is illustrated in Table 8 below:

Table 8: Long Term (Six-Year) GHG Reduction Target

Target Development	
2022 Forecast Portfolio Gross Annual m^3	242,805,492
kg $CO2_e$ / m^3 of Natural Gas	1.874
Year 1 (2022) Gross Annual GHG (tonnes)	455,017
Years	6
Stretch Factor	15%
Long Term (Six-Year) GHG Reduction Target - (tonnes)	**3,139,621**

[3] EB-2021-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

TRC-PLUS AND NET BENEFITS SUMMARY

1. Cost effectiveness screening for the DSM Plan will use the TRC-Plus test as directed by the OEB in the DSM Letter and as detailed in the Proposed Framework (Exhibit C, Tab 1, Schedule 1, Section 10.3). For screening purposes, the TRC-Plus test should be performed at both the program and portfolio level.[1]

2. The results of the TRC-Plus test can be expressed as a ratio of the present value ("PV") of the benefits to the PV of the costs.

3. If the ratio of the PV of benefits to the PV of the costs (the "TRC-Plus ratio") exceeds 1.0, the DSM program is considered cost effective as it implies that the benefits exceed the costs. Since low income natural gas DSM programs may result in important benefits not captured by the TRC-Plus test, these programs should be screened using a lower threshold value of 0.70 instead, but as noted in the Proposed Framework, offerings may be considered at a lower threshold.

4. An alternative way to consider the cost-effectiveness of a program is to determine whether the TRC-Plus net savings (or Net Benefits) are greater than zero. The Net Benefits are equal to the PV of benefits less the PV of costs.

5. The following Table 1 provides the portfolio and program level TRC-Plus screening results as required for the DSM Plan for the 2022 year. For information purposes, the offering level values are also presented. In addition, the table also summarizes the Net Benefits forecast for the portfolio including details for each of the components for 2022.

[1] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, p. 17, reference: "Market transformation programs are not amenable to a mechanistic cost-effective screening approach and should be reviewed on a case-by-case basis instead.".

Table 1: 2022 TRC-Plus and Net Benefits

2022 TRC-Plus Forecast	TRC-Plus Benefits	TRC Costs	Net Benefits[1]	TRC-Plus Ratio
Residential Program	**$125,706,884**	**$66,095,127**	**$59,611,756**	**1.90**
Residential Whole Home	$73,977,785	$45,922,221	$28,055,564	1.61
Residential Single Measure	$8,961,854	$7,507,666	$1,454,187	1.19
Residential Smart Home	$42,767,245	$11,206,000	$31,561,245	3.82
Program Level Admin		$1,459,240	-$1,459,240	
Commercial Program	**$133,540,929**	**$30,486,345**	**$103,054,584**	**4.38**
Commercial Custom	$103,530,272	$12,181,773	$91,348,500	8.50
Prescriptive Downstream	$8,696,432	$3,596,787	$5,099,645	2.42
Direct Install	$14,451,859	$5,755,838	$8,696,021	2.51
Prescriptive Midstream	$6,862,366	$5,654,650	$1,207,717	1.21
Program Level Admin		$3,297,298	-$3,297,298	
Industrial Program	**$210,099,973**	**$15,863,723**	**$194,236,250**	**13.24**
Industrial Custom	$210,099,973	$12,160,180	$197,939,793	17.28
Program Level Admin		$3,703,543	-$3,703,543	
Low Income Program	**$52,688,511**	**$19,946,137**	**$32,742,374**	**2.64**
Home Winterproofing	$22,736,285	$13,993,095	$8,743,189	1.62
Affordable Housing Multi-Residential	$29,952,226	$4,533,295	$25,418,932	6.61
Program Level Admin		$1,419,747	-$1,419,747	
Large Volume Program	**$12,904,860**	**$4,620,019**	**$8,284,841**	**2.79**
Direct Access	$12,904,860	$4,407,642	$8,497,218	2.93
Program Level Admin		$212,377	-$212,377	
Energy Performance Program	**$0**	**$583,094**	**-$583,094**	**0.00**
Whole Building Pay 4 Performance (P4P)[2]	$0	$530,000	-$530,000	0.00
Program Level Admin		$53,094	-$53,094	
Building Beyond Code Program		**$4,861,013**		
Low Carbon Transition Program		**$618,393**		
Program Subtotal	**$534,941,157**	**$143,073,851**	**$391,867,305**	**3.74**
Portfolio Costs		$18,000,000		
Portfolio Total	**$534,941,157**	**$161,073,851**	**$373,867,305**	**3.32**

1. Net Benefits are the difference between the TRC-Plus Benefits and Costs.
2. Based on the program design, energy savings for P4P are not forecast until Year 2 (2023).

DSM PLAN - PROGRAM OVERVIEW

1. Since 1995 Enbridge Gas's energy efficiency programs have reduced customer consumption by 32.4 billion cubic metres of natural gas, enough natural gas savings to serve nearly 14.2 million homes for one year. These gas savings have resulted in a reduction of 60.8 million tonnes of greenhouse gas emissions, roughly equal to removing 13.2 million cars from the road for one year.

2. In delivering these savings to Ontario consumers, the Company has built valuable internal expertise to design and deliver successful DSM programs, as a trusted source of energy information, and assistance for customers. Enbridge Gas will continue to play an essential role in meeting the conservation objectives of the province by delivering natural gas savings to customers through a comprehensive portfolio of DSM programs

3. As a result of efforts over the next six year term, significant results will be achieved by working one-on-one, directly with larger commercial and industrial customers in continuation of Enbridge Gas's historical success working within this market segment to reduce consumption through custom program approaches. Enbridge Gas is also looking to increase flexibility for the residential sector, by far the Company's largest customer segment in terms of numbers of consumers, by diversifying offerings to encourage homeowners to undertake energy efficiency upgrades as they consider various improvements to their homes.

4. A key challenge in the coming DSM Plan will be the ongoing trend in energy efficiency projects; specifically, it continues to be incrementally more expensive to achieve fewer savings. A key observation over the past framework has been a greater number of projects yielding smaller results per project. This reality was acknowledged by the OEB in its DSM Letter:

> Based on the OEB's evaluated results of the 2015 to 2018 DSM programs, while still cost-effective, the level of natural gas savings achieved through DSM programs for each dollar spent has been decreasing. This may be related to Enbridge Gas striving to meet a number of different priorities, programs being extended to harder-to-reach customers, and recent updates to outdated assumptions.[1]

5. This is likely to be a continuing outcome as the Company works to expand offerings to address underserved sectors and those markets where savings are harder to reach, as well as address opportunities that entail more comprehensive, higher engagement approaches. Traditionally underserved markets include low income customer groups, especially those outside of large urban centres and in privately owned facilities, as well as smaller commercial and industrial markets where customers are not typically able to prioritize energy efficiency.

6. Enbridge Gas has taken steps to adapt its portfolio to address market evolution. The proposal developed by Enbridge Gas in this DSM Plan reflects the realities articulated above, and also incorporates new activities, offerings and technologies aimed at addressing the full range of DSM customers. For example, efforts to leverage mid-stream market actors, including directly incenting distributors and retailers, as well as targeted direct install approaches are intended to improve participation among these small business consumers.

7. Enbridge Gas has evaluated and reconsidered elements of its current programs to optimize overall program results and make good use of ratepayer funding. In so doing, Enbridge Gas has reflected on input received through the Post-2020 DSM framework consultation and has considered lessons learned from the 2015-2020 DSM Plan. Enbridge Gas has reviewed recommendations put forth from the Evaluation Contractor, stakeholder feedback from the Mid-Term Review consultation as well as commentary shared last year in the 2021 DSM plan proceeding. In addition, Enbridge Gas has consulted with customers, business partners and

---

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.

interested industry stakeholders on several fronts to deliberate on the next evolution of Enbridge Gas DSM programming.

8. Importantly Enbridge Gas has had an opportunity in the past 24 months to assess the designs of each of the Union and EGD rate zone DSM plans for the 2015-2020 program years and compare and contrast models, approaches, tactics and structures in an effort to combine the best features of the respective programs. The analysis has also helped to understand what gaps continue to persist in serving customers province-wide as an amalgamated utility.

9. A good example of the derived benefit from combining utility market expertise and reconsidering the features of Union and EGD rate zones offerings, is the Building Beyond Code Program. As codes and standards are changing at an accelerated pace to support government climate change policies, Enbridge Gas is positioned to play a substantive role in supporting the movement toward Net Zero construction, while at the same time limiting lost opportunities for energy efficiency in new construction. The Company's residential new construction offering will encourage residential builders to tackle the challenges presented in building to Net Zero Energy Ready standards. In the commercial new construction market, the offering has recognized that a flexible approach is needed to ensure builders are well positioned to not only build beyond code, but beyond rising municipal Green Development Standards ("GDS") despite the incremental financial cost increases that will be incurred.

10. In support of an expected increase in performance based code requirements in the coming years, Enbridge Gas is introducing an Air Tightness Testing offering in the commercial space to work with builders to better understand the necessity for such testing, and support the remediation of any air tightness deficiencies highlighted.

11. A key focus of the DSM Plan proposal is encompassed in the Low Carbon Transition Program which is intended to take important first steps to encourage early adoption of lower carbon technologies that will be a crucial component in the energy evolution of the province over the next ten to fifteen years. In Ontario, buildings account for approximately one quarter of GHG emissions[2], efforts to decarbonize must address the heating needs of these buildings. Enbridge Gas is well positioned to build awareness, support training, and incent market adoption of heat pump technology systems that will provide a springboard to broader market acceptance in these higher efficiency opportunities. Notwithstanding their environmental benefits, providing customers with the understanding, accessibility, and financial support to consider these options is crucial to begin to propel uptake. Enbridge Gas can play a vital role in creating momentum and support the initial stages of market transformation for this next generation of heating-and-cooling systems.

12. All levels of government have made known the desire to reduce greenhouse gas emissions and have articulated target reductions for both 2030 and 2050. As a natural gas distributor, Enbridge Gas can assist customers to achieve significant reductions in their natural gas consumption, which will, in turn drive GHG emissions reductions. These efforts must create awareness, incorporate education, and help deploy new technologies in all market segments, particularly with respect to thermal building envelope improvements. Many of the barriers and issues that will be encountered are yet unclear. This transformational shift will take years, so Enbridge Gas has proposed a multi-year program that will be evaluated at the mid-point of this plan after the first three years.

13. In the schedules that follow in this exhibit, the Company provides an overview of each of its programs and the underlying offerings being proposed in this DSM

---

[2] Government of Ontario, Ontario's Five Year Climate Change Action Plan 2016-2020, Queen's Printer for Ontario: Toronto, Section 7, Action area – Buildings and homes: Reduce emissions from fossil-fuel use in buildings. https://www.ontario.ca/page/climate-change-action-plan#section-6

portfolio. Enbridge Gas's DSM Plan meets the OEB's stated primary and secondary objectives. The Company outlines how the programs and offerings address these priorities as well as the guiding principles outlined in the Proposed Framework.

14. Exhibit E, Tab 1, Schedule 2 to Exhibit E, Tab 1, Schedule 6 outlines the Resource Acquisition programs where the Company has proposed base year 2022 targets with subsequent year targets established by way of the TAM (as outlined in Exhibit D, Tab 1, Schedule 3). This group includes the following programs:
    - Residential Program Scorecard
    - Low Income Program Scorecard
    - Commercial Program Scorecard
    - Industrial Program Scorecard
    - Large Volume Program Scorecard

15. Exhibit E, Tab 2, Schedule 1, and Schedule 2 encompass the program descriptions for:
    - Energy Performance Program Scorecard
    - Building Beyond Code Program Scorecard

    As stated previously, these offerings differ from the group above as they involve a multi-year engagement with participants and as such, annual targets and metrics for these offerings has been proposed by Enbridge Gas vs. established by TAM in subsequent years beyond the base year.

16. The Low Carbon Transition Program described above is detailed in Exhibit E, Tab 3, Schedule 1.

DSM PLAN – RESIDENTIAL PROGRAM

Residential Sector Strategy

1. Enbridge Gas's proposed Residential program builds on the successes and learnings of the existing Residential program, while incorporating new offerings and elements. The changes proposed are in response to a variety of inputs, including the following:
   - The objectives outlined in the OEB's December 1, 2020 letter (EB-2019-0003);[1]
   - The guiding principles outlined in the Proposed Framework;[2]
   - Lessons learned by Enbridge Gas through delivering programming to the residential sector for over 25 years; and
   - Feedback received from stakeholders through the course of the 2015-2020 DSM Plan, subsequent 2021 DSM Plan application, and in support of the development of this application.

2. The residential sector can be divided into two different markets, existing housing and new construction. These markets have different market actors and operate under different performance baselines. The Residential program is primarily focused on reaching the existing housing market. Enbridge Gas's strategy for driving gas reductions and supporting energy efficiency in the residential new construction market is outlined in the Residential Savings by Design offering detailed below in paragraph 12.

3. 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. This segment also includes low income residential customers, however, in recognition of the unique

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[2] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, pp. 6-8.

needs and additional barriers faced by this community, low income customers are supported directly through the Low Income program detailed in Exhibit E, Tab 1, Schedule 3. Of note, as further discussed below, Enbridge Gas is exploring efforts to support moderate income customers in coordination with the IESO by way of providing increased support with some residential programming.

4. The predominant natural gas end use in the residential sector is space and water heating, which represents approximately 90% of all consumption. In addition, homeowners continue to enjoy the benefits of natural gas for other applications, including indoor and outdoor cooking, and laundry.

5. Naturally, it is important to the typical customer to live in an energy efficient home. Among other factors, the thermal envelope, including insulation, is a key component of energy efficiency. However, homeowners may not be aware of the level of insulation in their homes or have funds available to undertake these upgrades. The Residential program aims to inform customers on what is often the reality, that there is potential for improved energy efficiency in their home. Enbridge Gas continues to be well positioned to deliver a Residential program with enhanced offerings to support homeowners in improving their home's energy efficiency.

Changing Energy Landscape

6. Over the course of the 2015-2020 DSM Framework, there were significant changes in the residential energy landscape. These changes impacted Enbridge Gas's design and delivery of DSM programming to the residential sector.

7. In 2019, Natural Resources Canada ("NRCan") introduced Amendment 15 to the federal Energy Efficiency Regulations, which set the new minimum standard for gas furnaces at 95% Annual Fuel Utilization Efficiency ("AFUE") from the previous 90% standard. As a result of this significant code change, Enbridge Gas redesigned the

incentive structure of the Home Efficiency Rebate ("HER") offering to shift participant uptake towards insulation measures, which now represent the largest energy savings opportunity in the typical residential home. The changes to the incentive structure have also resulted in a reduced prevalence of furnace upgrades in HER projects.

8. In the 2020 Fall Economic Statement, the federal government announced plans to provide $2.6 billion over seven years to help homeowners improve their home energy efficiency with grants of up to $5,000, through the Greener Homes Initiative.[3] Though specific details have not yet been publicized, it is anticipated that the program will focus on the provision of funds to complete residential energy-efficient improvements and EnerGuide energy assessments.

9. In addition, the federal government recently announced in the 2021 Budget "$4.4 billion to the Canada Mortgage and Housing Corporation (CMHC) to help homeowners complete deep home retrofits through interest-free loans worth up to $40,000."[4] Enbridge Gas anticipates opportunities to coordinate with external parties in support of these efforts through coordinated approaches with in-market DSM offerings.

10. In anticipation of federally supported government carbon reduction programming, combined with growing interest amongst municipalities in promoting energy programs regionally, Enbridge Gas is of the view that allowing flexibility in the design and delivery of the Residential program will best support all stakeholders and allow for coordinated and responsive DSM programming that can adapt with external efforts. Enbridge Gas is confident in its abilities to coordinate with external parties in

---

[3] Supporting Canadians and Fighting Covid-19, Fall Economic Statement 2020, (November 30, 2020), Section 3.3.2.1 Action Starts at Home: Home Energy Retrofits, p.88.
[4] A Recovery Plan for Job, Growth, and Resilience, Budget 2021, Ministry of Finance, Government of Canada, (April 19, 2021) p. 177.

the delivery of future residential programming noting previous successful collaborative efforts such as the Green Investment Fund and Whole Home program enhancements (delivered collaboratively with the Ontario Ministry of Energy, Northern Development and Mines, and the Independent Electricity System Operator, respectively).

Lessons Learned

11. In the residential sector, there appear to be three key barriers that have the ability to limit participation in DSM programming, which can be addressed by considering the following questions: Do the customer and contractor know the program exists? Do the customer and contractor understand how the program can benefit them? Can the customer easily participate in the program? Enbridge Gas is working to address these three barriers.

Market Awareness of the Program

12. Up until the last few years, Enbridge Gas's conservation results in the residential marketplace for the whole home retrofit offering were driven at the point where homeowners engaged with HVAC contractors during mechanical maintenance, upgrade, or failure. This often represented an opportunity when the customer was required to make an investment into the HVAC of their home, regardless of competing financial priorities and was also an opportunity to encourage additional upgrades. In the last few years, Enbridge Gas has been shifting focus toward the homeowner's consideration of thermal envelope improvements, to the point where these envelope measures now surpass the 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.

13. Enbridge Gas intends to address this barrier by continuing to build market awareness of the Residential program through the following avenues:
    - Leveraging various data driven tools and marketing tactics to reach the target customer.
    - 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.
    - Enbridge Gas will employ digital and traditional marketing tactics, as well as promotion through participating manufacturers, retailers, and contractor networks. Enbridge Gas may also utilize cross promotion across Residential DSM Offerings.
    - Alignment of offerings with municipal conservation priorities in order to create joint outreach opportunities.

Market Engagement with the Program

14. Customers are less likely to participate in the Residential program if they are unaware of the virtues of an energy efficient measure in comparison to in situ conditions. Further, contractors are less likely to promote the Residential program if they are unaware of the benefits of the program. Examples of this barrier include the following:
    - A customer who is not aware of what energy efficiency upgrades are available
    - The belief that a customer’s home is adequately or well insulated when that is not the case
    - Concerns that a Smart Thermostat device will be difficult to install or use, incompatible with their HVAC system, or will not generate additional savings

- A contractor who does not know the financial incentives associated with a measure may suggest a less expensive and less energy efficient measure to their client

15. Enbridge Gas will address this barrier by expanding customer engagement through additional customer facing energy literacy tools. For example, Enbridge Gas is currently exploring data driven initiatives to support homeowners by identifying and quantifying energy efficiency opportunities in their homes.

16. In addition, Enbridge Gas will enhance market engagement by leveraging the client-contractor relationship. Enbridge Gas will expand sales training and marketing support to the residential contractor network to more effectively promote the Residential program and provide additional value to the contractor's business.

Customer Access to Program

17. A customer can experience a barrier to participating in the Residential program in a variety of ways, including the upfront cost, time required or competing priorities for household financial investments.

18. In response, 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 still pursue a whole home approach to undertake energy efficiency improvements, however, additional offerings will support individual, single measure upgrades in the home including, for example, 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 continue but will also now provide moderate income customers[5] with an increased incentive to overcome a potential cost barrier in coordination with IESO CDM programming delivered to moderate income households in Ontario.

19. Enbridge Gas is also exploring the development of virtual audit alternatives in the event that a customer experiences challenges arranging an in-person energy audit. For example, this will address accessibility hurdles as has been the case serving customers during the COVID-19 pandemic.

Residential Program Proposal

20. Enbridge believes that a Residential program that provides choice and flexibility can best support the residential market by delivering an array of options for participation. This will provide the best opportunity to help customers understand the benefits of focusing their time on the specific energy efficiency improvements in their homes.

21. To reduce natural gas consumption, increase home comfort, and help customers manage their energy bills, Enbridge Gas will continue to focus efforts on helping consumers in reducing the most significant loads in the home, which are largely space heating followed by water heating. The measures that help reduce the space heating load include mechanical solutions, such as high efficiency furnaces, boilers, or water heaters, thermal envelope improvements that focus on reducing heat loss, such as insulation and air sealing, and advanced controls that optimize comfort with fuel savings, such as smart thermostats.

22. Enbridge Gas is proposing three residential offerings to target the needs and challenges of the residential housing sector. By providing multiple participation options a customer can choose the offering that best addresses their individual

[5] Eligibility details described in the Offering Details in paragraph 52 below.

needs. The offerings work together to overcome the unique challenges and barriers faced by customers across the sector.

Offering Name	High Level Description	Key Offering Elements
Whole Home	The Whole Home offering provides a holistic approach to residential home energy upgrades by providing customers incentives towards their home energy audits and thermal envelope and mechanical system upgrades. The intent is to motivate homeowners to pursue deeper energy savings across additional measures than they may have otherwise undertaken by taking a whole home view.	• Education • Marketing/Communication • Financial Incentives • Home Energy Audit with report detailing upgrade recommendations •
Single Measure	The Residential Single Measure offering provides a simplified and flexible approach for customers seeking to improve their home's energy performance. Customers using a contractor can receive single measure incentives in support of insulation or professional air sealing upgrades with no home energy audit requirement.	• Education • Marketing/Communication • Financial Incentives • Contractor training and outreach
Smart Home	The Smart Home offering provides residential customers with incentives towards smart home	• Education • Marketing/Communication • Financial Incentives

	technologies, which provide automated controls to reduce energy consumption.	Enhanced incentives available for moderate income customers in coordination with the IESO[6]

OEB Objectives and Guiding Principles

23. The Residential program has been designed to support the OEB's primary objective: "Assisting customers in making their homes and business more efficient in order to help better manage their energy bills."[7]

24. The flexible design with multiple points of entry should allow for a more cost-effective program over time as well as more widespread opportunity for customer participation based on their individual needs and situation. In addition, Enbridge Gas has coordinated efforts with the IESO in the evolution of the Smart Home offering in support of moderate income consumers.

25. The Residential program also addresses the guiding principles[8] outlined in the Proposed Framework including:
    - DSM plans should be designed to provide opportunities for a broad spectrum of consumer groups and customer needs to encourage widespread customer participation over time and "ensure all segments of the market are reached."
    - DSM plans should include strategies to increase the natural gas savings by targeting key segments of the market and/or customers with significant room for efficiency improvements.
    - DSM plans should minimize lost opportunities for energy efficiency and should be designed to pursue long term energy savings.

[6] Eligibility details described in the Offering Details in paragraph 52 below.
[7] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[8] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, pp. 6-8.

- Enbridge Gas should endeavour to coordinate the delivery of DSM with electricity CDM efforts where possible.

Whole Home Offering

Background

26. This offering was introduced to the gas utilities' DSM portfolios in 2012. Though the legacy utilities delivered slightly different programming over the years, following the amalgamation forming Enbridge Gas in 2019, all customer facing elements were aligned so that any Enbridge Gas customer participating in the offering from across the province would have the same customer experience. In 2020, the offering was adjusted to reflect the impacts of updates to gas furnaces regulations specified in Federal Energy Efficiency Regulation Amendment 15,[9] specifically the increase in residential furnace baseline, and the focus of HER shifted toward encouraging and supporting thermal envelope improvements.

27. Through the course of the 2015-2020 DSM Plan, HER was well received by customers and demonstrated strong success, however, Enbridge Gas customer feedback has indicated that customers who may not be in a position to participate in the HER offering, could benefit from a simplified offering. Enbridge Gas is working to increase participation through the introduction of the Single Measure offering in order to provide customers with this flexibility. For those customers who have the time, means and interest in participating in a holistic approach inclusive of home energy audits and multiple upgrade projects, Enbridge Gas believes the Whole Home offering will continue to drive strong participation and deep savings for residential homeowners.

[9] https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency/gas-furnaces/6879

Objective

28. The goal of the Whole Home offering is to help homeowners manage their energy consumption and in turn their energy bills by encouraging a whole building, or holistic approach to identifying opportunities for energy efficiency upgrades, in an effort to achieve deeper savings across a number of improvements undertaken as part of one project.

Target Market

29. The Whole Home offering is targeted to Residential customers, subject to eligibility details outlined below.

Offering Details

30. Participation in the Whole Home offering will consist of three separate activities:
    i. An initial home energy audit, called the pre-assessment, conducted by a Registered Energy Advisor through a Service Organization licensed by NRCan.
    ii. Installation of at least two eligible measures. Participants installing a furnace must install three eligible measures.
    iii. A final home energy audit, called the post-assessment, conducted by a Registered Energy Advisor through a Service Organization licensed by NRCan.

Eligibility Criteria

31. To be eligible for the offering, a participant must be a residential Enbridge Gas customer whose residence (which may include detached house, semi-detached house, row house, townhouse, or a mobile home with a permanent foundation) is heated with natural gas.

Incentives/Enablers[10]

32. There are three types of incentives available for participants: measure incentives, assessment incentives, and bonus incentives.

33. Measure incentives are provided to participants according to the measure installed. Table 1 details the measure incentives contemplated at the time of submission.

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,	$250 for furnace or $1,000 for boiler

[10] Incentive details are provided as currently contemplated, Enbridge Gas routinely examines and adjusts incentive amounts in response to opportunities and market conditions, and in an effort to maximize program performance and results over the course of the Multi-Year term.

Measure	Criteria	Incentive
	For replacing a less than 90% AFUE natural gas boiler with a 90% AFUE or higher condensing natural gas boiler.	
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
Window/Door/Skylight	For each window, door or skylight replaced with an ENERGY STAR qualified model.	$40

34. Assessment incentives are provided to cover a significant portion of a participant's audit related costs. Specifically, participants receive $550 for completing the pre and post energy audits.

35. Bonus incentives are designed to encourage participants to install additional measures in order to achieve deeper savings. The bonus incentives schedule is contemplated as follows:
    - $150 for three measures
    - $500 for four measures
    - $750 for five or more measures
    - An additional $500 bonus incentive for participants who insulate 100% of their basement.

Considerations for Continuous Improvement

36. Enbridge Gas is currently conducting a pilot on virtual audits to determine its viability as a future offering enhancement. Virtual audits aim to provide the same benefits and outcomes as a traditional audit. Using artificial intelligence and software, they can analyze a set of data to determine current building performance and provide recommendations to improve the building's energy efficiency. Data inputs include

weather information, location, usage, data from similar buildings, and other publicly available information. Results of the pilot will not be available until 2022.

37. On a larger scale, implementing virtual audits may have benefits that will require investigation by Enbridge Gas. Virtual audits may be a lower cost option, which would allow Enbridge Gas to reach more customers. Further, they have the potential to reach customers who otherwise would have trouble arranging an in-person audit, as has been the case due to COVID-19.

Metrics

38. The primary metric for the Whole Home offering is net annual natural gas savings, measured in m^3.

Gross Measurement

39. NRCan HOT2000 software, used in Energuide Mode, is required for estimating natural gas savings for participants in the Whole Home offering. Homes will be initially modelled based on the existing state of the home and again based on the post-retrofit state of the home. All completed HOT2000 assessments and associated documentation will be submitted to NRCan in accordance with its QA/QC processes.

40. To correctly claim energy savings, Enbridge Gas will make adjustments to the savings determined by the HOT2000 models to account for baseline considerations as appropriate.

Impact Evaluation and Verification

41. Enbridge Gas recommends that verification of project files may be appropriate for this offering. Specifically, a verification would ensure that data being tracked by Enbridge Gas for projects is aligned with the information reported by delivery agents in the field.

Process Evaluation

42. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Single Measure Offering

Background

43. This is a new offering in the 2022-2027 DSM Plan. This offering aims to reduce the barriers that may prevent a customer from participating in the Whole Home offering, such as costs, timing, and building condition. The introduction of this offering also supports efforts to increase the focus on thermal envelope improvement opportunities in residential homes.

Objective

44. The goal of the Single Measure offering is to encourage broader participation in the Residential program through the delivery of a simplified, single measure alternative, encouraging additional customers to undertake energy efficiency improvements and work with contractors on identified home improvement projects. While participation in the Single Measure offering will typically not drive as much savings as a multiple measure project completed through the Whole Home offering, it provides additional options for customers to participate in the Residential program.

Target Market

45. The Single Measure offering is targeted to Residential customers subject to eligibility details outlined below.

<u>Offering Details</u>

46. Participation in the Single Measure offering consists of the installation of an eligible single measure by a participating contractor. No energy audit is required.

<u>Eligibility Criteria</u>

47. To be eligible for the offering, a participant must be a residential Enbridge Gas customer whose residence (which may include detached house, semi-detached house, row house, townhouse, or a mobile home with a permanent foundation) is heated with natural gas. Participants must use a participating contractor. and may only qualify for one eligible measure per project.

Eligible Measures and Associated Incentives[11]

48. Initially the proposed list of measures for the Single Measure offering will consist of:
    - Wall insulation
    - Attic insulation
    - Basement insulation
    - Professional air sealing

Insulation Measures

49. Enbridge Gas is in the process of conducting research to inform substantiation documents for the three insulation measures proposed above. It is anticipated that these substantiation documents will become a part of the Technical Resource Manual ("TRM"). Until such time as the substantiation documents are finalized, Enbridge Gas has estimated energy savings values and associated input assumptions for each measure, upon which budgets, incentives and annual gas savings targets have been forecast. Enbridge Gas intends to update these values upon finalization of the substantiation documentation.

[11] Incentive details are provided as currently contemplated, Enbridge Gas routinely examines and adjusts incentive amounts in response to opportunities and market conditions, and in an effort to maximize program performance and results over the course of the Multi-Year term.

50. Participant incentives will be based on the quasi-prescriptive calculations outlined in the substantiation documentation. Based on research currently in progress, Enbridge Gas is anticipating the following average participant incentives:
    - Wall insulation: $1,125
    - Attic insulation: $ 576
    - Basement insulation: $ 625

Professional Air Sealing

51. Professional air sealing will be delivered as a project specific, custom measure that will be installed through a third-party delivery agent and a network of professionally trained contractors. These participating contractors will conduct a guided blower door test to determine the major sources of air leakage in a participant's home. Mitigation such as sealing air leaks with caulking, weather-stripping, spray foam, or other permanent air sealing techniques, will be completed to address air leakage.

52. The pre and post installation air change values, determined by the guided blower door test, are key inputs into a custom calculator which will be designed to determine the natural gas savings associated with the project. The custom calculator is currently being developed as part of Enbridge Gas's ongoing Professional Air Sealing Pilot, through in-home research and testing of identified professional air sealing installation projects.

53. Participant incentives will be commensurate with calculated natural gas savings. Enbridge Gas is anticipating an average participant incentive of approximately $450 per home or $2.25/m^3 saved. This value may be revised upon finalization of the custom calculator.

54. 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.

Metrics

55. The primary metric for the Single Measure offering is net annual natural gas savings, measured in m^3.

Gross Measurement

56. For prescriptive measures, the offering will use the TRM (including the established process for the introduction of new measures) as the basis for natural gas savings (m^3) gross measurement. Projects must meet requirements as outlined in the version of the TRM applicable to the program year.

57. For project-specific inputs in the case of professional air sealing, a custom calculator will be used.

Impact Evaluation & Verification

58. Enbridge Gas does not recommend impact evaluation for this offering in the near term as the results of the offering are generally prescribed by the TRM (with the exception of the air sealing measure). As air sealing is a new measure, Enbridge Gas recommends that an assessment of appropriate impact evaluation activities occurs once actual participation levels are better understood. Additionally, verification adjustments to account for the installation (or removal) of single measures may be appropriate in the future.

Process Evaluation

59. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Smart Home Offering

Background

60. The Smart Home offering is an extension of the Residential Adaptive Thermostat Offering that has been in market through the 2015-2020 Multi-Year DSM Plan. The proposed offering is focused on providing an incentive towards the purchase of qualifying smart controls that help optimize comfort with fuel savings, such as Smart Thermostats. This offering has been enhanced through a collaboration with the IESO to provide an additional financial incentive for qualified moderate income customers.

Objective

61. The goal of the Smart Home offering is to encourage the installation and use of a smart control device in the homes of residential customers thereby helping them manage their energy consumption and in turn their energy bills.

Target Market

62. The Smart Home offering is targeted to residential customers subject to eligibility details outlined below, with an additional focus on customers who qualify as moderate income eligible.

Offering Details

63. The Smart Home offering provides residential Enbridge Gas customers with incentives to support the purchase of smart control devices. Currently, the offering

provides an incentive for qualifying smart thermostats, which control temperature settings to drive incremental energy savings to a customer's space heating load. Enbridge Gas will continue to monitor the smart home space in order to introduce additional smart control devices to the offering as they become market ready.

64. The offering will be delivered using an online incentive platform that connects two incentive delivery mechanisms: instant retail incentives and contractor led incentives.

65. Instant retail incentives will be provided directly upon purchase to the customer at participating retailers or e-commerce sites. Contractor led incentives, also known as post-purchase incentives, will be available to participants who purchase an eligible smart control device through a contractor. Enbridge Gas uses a third-party to provide and manage a contractor portal to facilitate this incentive delivery mechanism. In this way, Enbridge Gas is striving to improve customer access to the offering by providing flexibility in participation options through multiple delivery channels (i.e., in store, online, or through a contractor).

IESO Delivery Coordination

66. Enbridge Gas is working with the IESO, specifically coordinating with their Energy Affordability Program (EAP), to target moderate income customers.[12] The offering will be delivered collaboratively and will allow IESO's EAP participants with natural gas heating to benefit from enhanced Enbridge Gas incentives for the purchase of Smart Thermostats. The IESO will support lead generation and income qualification for measure uptake. Participants will receive a coupon which they can provide to a participating retailer to receive an enhanced instant incentive beyond the standard residential offering.

[12] Specific eligibility requirements are detailed below.

<u>Eligibility Criteria</u>

67. To be eligible for the Smart Home offering, a participant must be a residential Enbridge Gas customer whose residence (which may include for example detached house, semi-detached house, row house, townhouse, or a mobile home with a permanent foundation) is heated with natural gas. Customers who have previously received a Smart Thermostat incentive or device through Enbridge Gas DSM programming are not eligible for the Smart Thermostat measure incentive.

68. As part of Enbridge Gas's collaboration with the IESO, an enhanced incentive will be available to customers who meet income eligibility qualification in line with the IESO Tier 2 income qualification under IESO's Energy Assistance Program guidelines. Specifically, to qualify for Tier 2 (or "moderate income") support, the participant must:

1. Be an individual who owns, rents or leases a residence in Ontario and is listed as the primary or secondary utility account holder;
2. Not meet the eligibility for Tier 1 support (as detailed in the Low Income program in Exhibit E, Tab 1, Schedule 3; and,
3. Have an annual household income for the previous year that does not exceed 157% of the most recent Statistics Canada before-tax Low Income Measurement (LIM). As at May 2021 this would equate to the following limits:

Number of people in the home	Before-tax household income
1	$46,748
2	$58,453
3	$70,158
4	$81,863
5	$93,568
6	$105,273
7+	$116,978

Incentives/Enablers[13]

69. Eligible participants will receive a $75 incentive towards the purchase of a qualifying smart control device. At the current time, devices include qualifying Ecobee, Emerson, Honeywell, and Nest smart thermostats. 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.

Metrics

70. The primary metric for the Smart Home offering is net annual natural gas savings, measured in m^3.

Gross Measurement

71. The offering will use the TRM as the basis for natural gas savings (m^3) gross measurement. Projects must meet requirements as outlined in the version of the TRM applicable to the program year.

Impact Evaluation & Verificiation

72. Enbridge Gas recommends that verification may be appropriate to confirm the installation of measures purchased by customers through a retail channel.

Process Evaluation

73. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

---

[13] Incentive details are provided as currently contemplated, Enbridge Gas routinely examines and adjusts incentive amounts in response to opportunities and market conditions, and in an effort to maximize program performance and results over the course of the Multi-Year term.

ENBRIDGE GAS DSM PLAN - LOW INCOME PROGRAM

Low Income Sector Strategy

1. Enbridge Gas has a strong history of successful delivery of energy efficiency programs specifically designed to meet the needs of lower income customers. There are two different measures of poverty and housing need, the Low Income Measure, after tax ("LIM-AT") and Core Housing Need ("CHN"), that each suggest about 15% of people in Ontario fall below the threshold for each measure.[1] Enbridge Gas's Low Income program is intended to serve these constituents, including families living in both social and privately owned housing, and in both single and multi-family residential buildings across the province.

2. Of growing concern, Ontario is at risk of losing considerable supply of social and affordable housing stock due to deteriorating conditions and expiring social housing provider agreements. At present, a large portion of affordable housing stock is over 40 years old and large investment is needed to preserve housing suitability.[2] It is estimated that about a third of available social housing stock could expire and transition to privately owned and operated housing in the next 10 years.[3]

3. Enbridge Gas is uniquely positioned to support broader investment into the capital upgrades and energy retrofit requirements facing these buildings. Enbridge Gas has the experience and record of success in delivering programming, including financial incentives and technical support, to facilitate upgrades in the energy systems of

[1] Community housing renewal: Ontario's action plan under the National Housing Strategy, Ministry of Municipal Affairs and Housing. https://www.ontario.ca/document/community-housing-renewal-ontarios-action-plan-under-national-housing-strategy/housing-needs-ontario
[2] Ibid.
[3] Ibid, sourced from Auditor General of Ontario, Annual Report 2017.

social housing buildings. Enbridge Gas also recognizes that increasing numbers of low income customers are living in privately owned buildings due to the shortage of social housing in the province, and appreciates the need to improve efforts to identify and target these buildings franchise-wide by extending support through the Affordable Housing Multi-Residential offering.

Barriers

4. Low income households can be challenging to find, often because customers are hesitant to self-identify as low income. Once identified, there are several other barriers preventing low income customers from participating in energy efficiency programs, including:

   - Affordability and access to funds to make equipment upgrades and repairs;
   - Awareness or limited understanding of energy and energy use;
   - Competing priorities for necessities such as food, shelter, health and safety;
   - Lack of trust – skepticism that “nothing is free”, or fear of claw backs of financial assistance; and
   - Communication / language barriers.

5. In addition, physical and structural problems within the housing units such as the presence of asbestos, pest infiltration or excessive hoarding, elevates the challenge and safety risk for residents (as well as contractors) in undertaking improvement projects. In these unfortunate instances, units are ineligible for participation until environmental and safety risks are adequately addressed.

6. 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.

7. In the case of multi-residential low income housing, barriers can include:

- competing priorities and lack of capital;
- a lack of awareness of efficiency upgrade opportunities;
- challenges understanding the complexities of a building's energy management;
- confusion or incorrect assumptions of perceived complicated participation requirements;
- other available funding involves a complex process to navigate which poses a barrier and timelines can be slow causing the housing provider to bear more costs; and
- limited human resources to identify and undertake efficiency projects.

8. The Low Income program has evolved over the last 15 years to meet the changing needs of customers and adapt to evolving market conditions. Enbridge Gas continuously monitors the cost of delivery, evaluates the mix of measures offered and tests modifications to incentive strategies to optimize results. Especially important with this market segment, Enbridge Gas routinely seeks customer feedback, learns from the on-the-ground experience of delivery agents, and solicits the valuable insights provided by key interested stakeholders with expertise in this sector.

9. Enbridge Gas consulted with several familiar stakeholders in preparing this application to revisit discussions for potential improvements. Enbridge Gas's proposals received positive support and stakeholders provided constructive feedback.

Low Income Program Proposal

10. Low income programming encompasses the following important components:
    - Strategic outreach specifically tailored to the unique characteristics of hard-to-reach customers;
    - Updated, province-wide income eligibility criteria, consistent with CDM criteria;
    - Turnkey, fully funded weatherization programming for income qualified residents of single family and low-rise social housing;
    - Inclusion of a health and safety budget to improve the safety and well-being of the home and aid in removing barriers to participation;
    - Standardized private multi-residential building eligibility screening; and
    - 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.

11. A high-level description of the Low Income Program offerings as well as their associated are listed below:

Offering Name	High Level Description	Key Offering Elements
Home Winterproofing	A free home energy assessment and weatherization services (i.e. insulation and air sealing) provided where possible at no-cost/low-cost to eligible participants.	• Free energy assessment • Full weatherization upgrades and direct install of improvement measures • Customer education and energy literacy

		• Health and safety components • Outreach and training to intake agencies • Marketing and Communications
Affordable Housing Multi-Residential	Enhanced prescriptive, custom, and direct install incentives for natural gas savings for multi-residential buildings classified as either social housing or privately owned buildings demonstrating high incidence of low income tenants.	• Financial Supports • Energy Assessments • Technical Assistance • Opportunity Identification • Education/Webinars/ • Marketing/ Communications

<u>OEB Objectives and Guiding Principles</u>

12. Enbridge Gas is pleased to continue delivering comprehensive programming for the low income sector through its franchise-wide Home Winterproofing and the Affordable Housing Multi-Residential offerings. In direct response to the OEB's primary objective for DSM, these offerings will continue to focus on supporting natural gas reductions through the installation of energy efficiency upgrades and building envelope improvements to achieve water and space heating savings and

help low income households become "more efficient in order to help better manage their energy bills."[4]

13. In line with guiding principles (and the OEB's specific direction in its December 1, 2020 letter), signaling that DSM planning should ensure that "small volume, low income and on-reserve First Nations communities are well served,"[5] the Low Income Single Family and Affordable Housing Multi-Residential offerings are designed distinctly from the other mass residential and commercial offerings to recognize and address the unique customer needs and barriers to participation faced by this market segment.

14. Similarly, reflecting DSM guiding principles, the Low Income program is "designed to provide opportunities for a broad spectrum of consumer groups and customer needs to encourage widespread customer participation over time and ensure all segments of the market are reached."[6] Within the low income customer group, there are several particularly hard-to-reach subgroups that require tailored customer outreach, notably First Nations communities, other visible minorities, recent immigrants and senior citizens.

15. Importantly, and also reflecting guiding principles, Enbridge Gas is engaged with the IESO examining how to appropriately coordinate DSM and electricity CDM efforts geared to low income households across the province. Enbridge Gas has already aligned income eligibility requirements for the Home Winterproofing program ("HWP") with the electricity income tested CDM program eligibility requirements, consistent with the Energy Affordability Program. Currently, Enbridge Gas and the IESO are in discussions exploring the possibility of a coordinated delivery of the

---

[4] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[5] Ibid, p. 5.
[6] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, p. 6.

single family low income offerings. This would allow for a single point of entry to province-wide programs for income eligible customers.

Home Winterproofing Offering

Background

16. This offering continues to support the province's most vulnerable populations by improving the energy efficiency of their homes and assisting customers in managing their natural gas bills. Low income is commonly described as households spending 30% or more of household income towards shelter costs.[7] For customers in this position, disposable household income to finance energy efficiency improvements which will result in savings on energy bills, is not typically available. To support these customers, the Home Winterproofing offering provides free energy assessments and no-cost/low-cost, direct install and weatherization upgrades to improve the home. To maximize the value of the free in-home energy assessment, Energy Advisors educate participants on how to manage energy use, and where warranted, implement health and safety measures.

Objective

17. The objective of the Home Winterproofing offering is to reduce energy costs for residents of single family households (typically low-rise housing including but not limited to detached, semi-detached, row/townhouse or mobile home with permanent foundation) by improving the energy efficiency of their homes.

Target Market

18. The target market for the Home Winterproofing offering includes:

[7] https://www.cmhc-schl.gc.ca/en/professionals/housing-markets-data-and-research/housing-research/core-housing-need/identifying-core-housing-need

- All single family social and assisted housing, including co-operative and non-profit housing.
- Residents in private single family (low-rise) dwellings who meet income qualification and eligibility criteria.
- Residents of on-reserve First Nations communities who meet income qualification and eligibility criteria.

Offering Details

19. The Home Winterproofing offering includes a free in-home energy assessment and weatherization services at no cost or low cost to the participant and addresses some health and safety measures as needed.

20. The Home Winterproofing offering provides support to single families on fixed incomes, those who rely on income assistance programs, and those who are generally most vulnerable to increases in energy prices. Enbridge Gas works with community-based organizations to promote and deliver the offering and leverages municipalities and associations active in the community to raise awareness. Enbridge Gas will also continue coordination with the Low-Income Energy Assistance Program ("LEAP"), wherein LEAP administrators are trained to prequalify and guide LEAP recipients to the Home Winterproofing offering.

21. 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.

Eligibility Criteria

22. To be eligible for Home Winterproofing, a participant must be an Enbridge Gas residential income eligible* customer.

*Income Eligibility

23. Consistent with the direction given by the OEB, Enbridge Gas has revised and aligned Low Income qualification screening criteria with the Tier 1 eligibility income criteria outlined in the IESO Energy Affordability Program as follows:

24. To qualify for low income (Tier 1) support, the participant must be:

i) A resident of an eligible social or assisted housing property:

Social and Assisted Housing, for the purposes of DSM Low Income programming includes:

- Non-profit providers of social or assisted housing under a federal, provincial or municipally funded program, and includes, without limitation, non-profit corporations governed by the Housing Services Act, 2011 (as amended or any successor legislation);
- Public housing corporations owned by municipalities directly or through local housing corporations;
- Non-profit housing co-operatives as defined in the Co-operative Corporations Act;
- Non-profit housing corporations that manage or own residential (including multi-residential) buildings developed under the “Affordable Housing Program”; and
- Non-profit organizations, or municipal or provincial governments that manage or own residential (including multi-residential) supportive housing, shelters and hostels

OR

ii) An individual who owns, rents, or leases a residence in Ontario and meets ONE of the following criteria:

a. Has an annual household income for the previous year that does not exceed 135% of the most recent Statistics Canada before-tax Low Income Measurement ("LIM"). As of May 2021, this would equate to the following limits:

Number of People in Household	Before-tax Household Income
1	$36,578
2	$51,729
3	$63,354
4	$73,157
5	$81,791
6	$89,598
7+	$96,775

b. Received one of the following types of assistance in the past 12 months.

- Allowance for Survivors
- Guaranteed Income Supplement
- Allowances for Seniors
- Ontario Works
- Ontario Disability Support Program ("ODSP")
- Healthy Smiles Ontario Child Dental Program

c. Received a Low-Income Energy Assistance Program ("LEAP") grant or were part of the Ontario Electricity Support Program ("OESP") within the last 12 months.

d. Qualified to participate in the Tier 1 CDM Energy Assistance Program ("EAP") formally known as the Home Assistance program ("HAP") during the past 12 months.

OR

iii) A resident of an on-reserve First Nation single family home that can demonstrate one of the following:
   - A letter from Band Housing confirming that community income thresholds are within income eligibility criteria, OR
   - Confirmation that the community has participated in the CDM Energy Assistance Program Tier 1 during the past 12 months.

Incentives/Enablers

25. The Home Winterproofing offering includes the following financial supports and services for participants:

i) Energy Assessment
All participants receive a free energy assessment (pre-assessment) of the home by a participating Energy Advisor. The Energy Advisor will do a walk-through of the home, identifying energy efficiency opportunities to the customer. The initial energy assessment is an opportunity to educate customers on how to improve the efficiency of the home and reduce gas bills. The Energy Advisor recommends suitable weatherization improvements to be completed in the home. After upgrades have been installed, the Energy Advisor returns to the home to conduct a post-assessment to verify the gas savings from any weatherization improvements completed.

ii) Direct Install Incentives

The home is prequalified for direct install measures at no or low cost to the customer and include showerheads, aerators, adaptive thermostats, and pipe wrap.

iii) Weatherization Services

Based on the findings of the energy assessment and identified deficiencies in the home, air sealing (draft proofing), and insulation upgrades to basements, walls and attics are procured and installed as necessary at no cost to the customer.

iv) Health and Safety Measures

A free carbon monoxide detector is installed in the home if there is none present during the energy assessment. In addition, DA's have access to a Health and Safety budget to address issues or barriers that are posing health and safety risks to residents and delivery agents that may otherwise prohibit participation in the offering.

Metrics

26. The metric for the Home Winterproofing offering is net annual natural gas savings, measured in m^3.

Gross Measurement:

27. NRCan HOT2000 software, used in General Mode, is currently required for estimating natural gas savings achieved from weatherization improvements of participants in the Home Winterproofing offering. Homes will be initially modelled based on the existing state of the home (pre-assessment) and again after upgrades have been installed in the home (post-assessment).

28. In the case of direct install prescriptive measures installed, the offering will reference the TRM as the basis for natural gas savings (m^3). Projects must meet requirements as outlined in the version of the TRM applicable to the program year.

Impact Evaluation & Verification

29. Enbridge Gas recommends that verification of project files may be appropriate for this offering. Specifically, verification would ensure that Enbridge Gas's tracking data for the projects are aligned with the information reported by DA's in the field. Furthermore, verification adjustments may be appropriate to account for the installation (or removal) of prescriptive measures.

30. Consistent with historical stakeholder consensus, free ridership is set at zero for all low income program offerings.

Process Evaluation

31. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Affordable Housing Multi-Residential Offering

Background

32. The AHMR offering was created to provide enhanced economic incentives and technical support to multi-residential buildings that house the province's most vulnerable populations. These buildings are typically government funded or non-profit social housing but increasingly include privately owned multi-residential housing. While similar to the Commercial Program offerings, the AHMR offering

provides incremental economic incentives to assist affordable housing providers overcome often larger capital cost constraints necessary to drive offering participation.

33. One of the biggest challenges in this market is the situation of split incentives whereby the building owner makes a significant financial investment in equipment or building upgrades, with limited or no ability to recoup their costs (i.e. through rental increases to tenants). Tenants, who are the ultimate energy consumers, do not have the same motivation to reduce their consumption. Participating building owners must sign an agreement to forgo Above Guideline Increase as a requirement to participate in the offering. Without the ability to recoup investment costs through rental increases, enhanced economic incentives can strengthen the business case to undertake an energy efficiency project.

34. Affordable housing and privately owned multi-residential building owners and property managers often do not have the staff to understand the technical aspects of their building or what energy improvements are needed in the building. With Enbridge Gas's technical support to assist building owners and property managers to better understand the energy efficiency options available to them, and enhanced incentives to buy-down the project costs, Enbridge Gas can help these customers realize meaningful energy savings while improving the comfort of the building for tenants.

Objective

35. The objective of the Affordable Housing Multi-Residential ("AHMR") offering is to reduce natural gas consumption and improve the energy efficiency of multi-residential buildings in the affordable housing market.

Target Market

36. The AHMR offering will target:

- all social and assisted housing providers including non-profit social housing providers, non-profit housing co-operatives, non-profit housing corporations, supportive housing, and shelters.
- owners/managers of privately owned multi-residential buildings that meet the eligibility criteria supporting high incidence of low income tenants.

Offering Details

37. The AHMR offering includes a mix of prescriptive, custom, and direct install measures depending on the needs of the customer. The offering also funds an energy assessment component for an in-depth evaluation of the building's energy usage to assist building owners and property managers who are unsure of where to start.

38. The AHMR offering will be delivered through:

    i) Enbridge Gas Energy Solutions Advisors ("ESA")
    ESAs work directly with social housing providers and eligible private building owners. ESAs maintain on-going relationships with social housing providers and key accounts to develop custom solutions, adopting a holistic, or "building as a system" approach wherever possible. ESAs will also work with municipalities and building associations to build awareness and identify opportunities.

    ii) Third Party Agents
    Third party agents are contracted by Enbridge Gas to install the direct install measures for eligible customers.

iii) Business Partners

Business partners are engaged to support identification of opportunities. These include equipment distributors; HVAC contractors; manufacturer representatives; engineering firms and energy consultants.

Incentives/Enablers

39. The AHMR offering includes prescriptive, custom, and direct install incentives, and includes the provision of energy assessments.

Prescriptive Incentives

40. The following prescriptive incentives are detailed in reference to the approved gas saving estimates reflected in the current Technical Resource Manual ("TRM").

Affordable Housing Multi-Residential - Prescriptive Measures	**Incentive Levels**
Condensing Water Heaters	\$0.80 - \$1.00/annual m^3
Condensing Make-Up Air Unit (MUA)	\$0.60 - \$1.90 per CFM
Energy Recovery Ventilator (ERV)-No existing ERV or not required by code	\$2.75 - \$4.00 per CFM
Energy Recovery Ventilator (ERV)-Improved Effectiveness	\$1.25 - \$1.75 per CFM
Heat Recovery Ventilator (HRV)-No existing HRV or not required by code	\$2.15 - \$3.30 per CFM
Heat Recovery Ventilator (HRV)-Improved Effectiveness	\$0.75 - \$1.50 per CFM
In-Suite Energy Recovery Ventilator (ERV)-No existing ERV or not required by code	\$175 - \$250 per unit
In-Suite Energy Recovery Ventilator (ERV)-Improved Effectiveness	\$60 - \$190 per unit
In-Suite Heat Recovery Ventilator (HRV)-No existing HRV or not required by code	\$150 - \$225 per unit
In-Suite Heat Recovery Ventilator (HRV)-Improved Effectiveness	\$40 - \$150 per unit

Custom Incentives

41. Custom incentives are available to support more complex and/or multi-measure energy improvement projects and are determined using project and site-specific inputs. Measures supported through the custom offering include, but are not limited to:

- Boilers
- Control Systems
- Building Automating Systems (“BAS”)
- Advanced Building Automation Systems (“ABAS”)

42. The proposed standardized incentive rate for gas savings achieved through custom projects is $1.00 per cubic meter up to 50% of the fully installed project cost to a maximum project incentive of $200,000.

Direct Install Incentives

43. Direct install measures provide turnkey energy solutions at low or no cost to the customer. Measures can include heat reflector panels and showerheads. Direct install incentives will cover up to 100% of the equipment and installation cost.

Energy Assessment Incentive

44. Social housing providers and privately owned multi-residential building owners that meet eligibility criteria are able to apply for an incentive toward the energy assessment of the building.

45. Enbridge Gas will fund the cost of a building assessment up to $8,000 per building. Assessment features may include:
    - Examination of all HVAC, controls, and lighting systems and building envelope (windows, insulation, etc.). Identifies all types and costs of energy use, with an emphasis on natural gas.
    - Inventory of opportunities and quantification of energy savings including estimated potential and calculated savings for each opportunity providing engineering calculations and/or modelling (RETScreen or equivalent).

- Provision of estimated costs for potential projects including return on investment or simple payback for recommended opportunities.

Metrics

46. The metric for the AHMR offering is net annual natural gas savings, measured in m^3.

Gross Measurement:

47. Custom Projects: This offering will employ several customized approaches in the calculation of natural gas savings (m^3) including engineering calculations and energy modelling, as determined reasonable by Enbridge Gas's technical experts. In the case of modelling analysis, specific tools may be used such as, eQUEST, EnergyPlus, CANQUEST, Integrated Environmental Solutions ("IES") and Tas Engineering. For commonly implemented measures, standard calculators have been developed such as e-tools to ensure that common baseline assumptions and calculation methodology are applied across similar types of projects.

48. Prescriptive and Direct Install Measures: Natural gas savings claims (m^3) will reference the current version of TRM applicable to the program year.

Eligibility Criteria

49. Participants must be an Enbridge Gas low income qualified* multi-unit residential building ("MURB")[8] customer.

    *In order to be eligible for participation in the offering, buildings must fall under one of the following classifications:

[8] Property used for residential purposes that typically has seven or more self-contained units, though some buildings may deviate from this general description.

Social and Assisted Housing, for the purpose of Enbridge Gas DSM Low Income programming includes:

a. Non-profit providers of social or assisted housing under a federal, provincial or municipally funded program, and includes, without limitation, non-profit corporations governed by the Housing Services Act, 2011 (as amended or any successor legislation);
b. Public housing corporations owned by municipalities directly or through local housing corporations;
c. Non-profit housing co-operatives as defined in the Co-operative Corporations Act;
d. Non-profit housing corporations that manage or own residential (including multi-residential) buildings developed under the “Affordable Housing Program”; and
e. Non-profit organizations, or municipal or provincial governments that manage or own residential (including multi-residential) supportive housing, shelters and hostels.

OR

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").

Impact Evaluation & Verification

50. Enbridge Gas recommends that third-party verification studies (also known as Custom Project Savings Verification studies, or "CPSV" studies) are appropriate for this offering since most gross measurement claims are developed by Enbridge Gas. However, since Enbridge Gas has been effectively and reasonably calculating project savings for several years as evidenced by minimal verification adjustments made to the low income results through the course of repeated annual audits, Enbridge Gas submits that less rigorous and multi-year CPSV studies are appropriate in an effort to reduce participant survey fatigue and manage evaluation costs.

51. Consistent with historical stakeholder consensus, free ridership is set at zero for all low income program offerings.[9]

Process Evaluation

52. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

[9] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1 , p. 17.

ENBRIDGE GAS DSM COMMERCIAL PROGRAM

Commercial Sector Strategy

1. Enbridge Gas's proposed Commercial program has been designed to meet the diverse needs of commercial customers, both large and small across a variety of market segments. The program builds off the success of existing offerings and incorporates new offerings to better address customer needs and market challenges. The changes proposed are in response to a variety of inputs, including:
   - The objectives outlined in the OEB's December 1, 2020 letter (EB-2019-0003)[1];
   - The guiding principles outlined in the Proposed Framework[2];
   - Lessons learned by Enbridge Gas in delivering offerings to the commercial market over the past Framework;
   - Feedback and recommendations from Custom Project Savings Verification ("CPSV") and Net-to-Gross studies conducted during the 2015-2020 Multi-Year DSM Plan; and
   - Feedback from stakeholders received through the course of the 2015-2020 Multi-Year DSM Plan and subsequent 2021 DSM Plan Rollover and in the development of this submission.

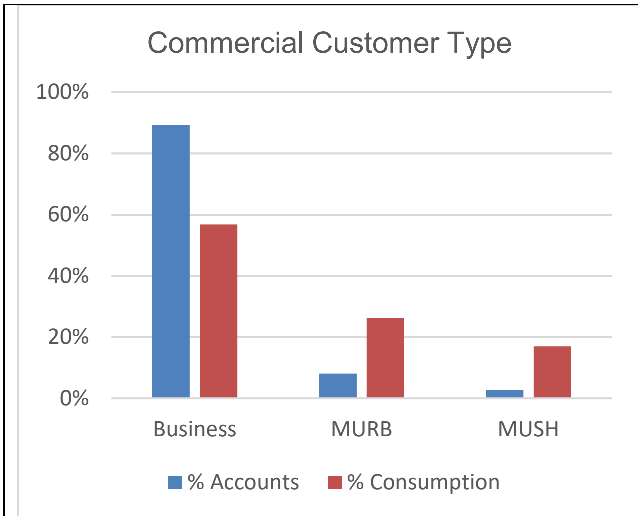
Market Overview

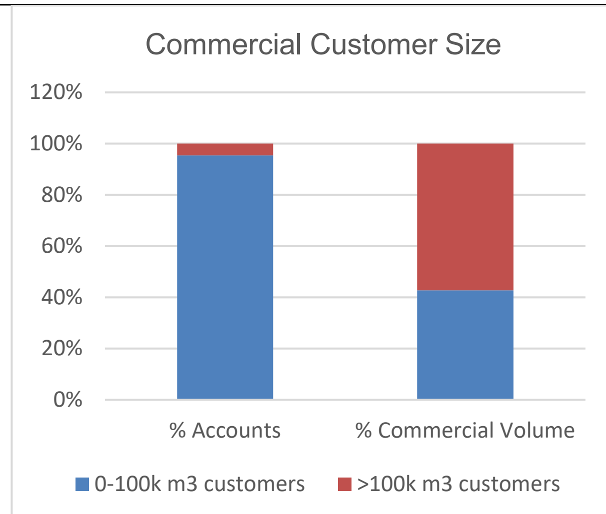
2. The commercial sector comprises over 250,000 customer accounts that collectively consume over seven billion cubic meters of natural gas annually. The market consists of a diverse group of customers with various motivators and barriers regarding the adoption of energy efficiency measures. These customers can be

[1] EB-2019-0003, OEB Letter Post 2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[2] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, pp. 6-8.

appropriately segmented by customer type and customer size. Table 1 below provide a breakdown of these segments.

Table 1





3. From a market segmentation perspective, Enbridge Gas has subdivided the commercial sector into three broad groups: Business, MUSH (Municipal, University, School and Hospital) and MURB (Multi-Unit Residential Building). The unique characteristics associated with each of these segments are described below.

4. The commercial Business segment includes private or corporately owned businesses such as long-term care facilities, office buildings, food service establishments, retail stores, warehouses, recreational centers, hotels/motels, entertainment complexes and places of worship. These customers represent 89% of accounts and 57% of consumption across the commercial sector.

5. Heating load requirements vary by sub-segment. Food service customers use natural gas for cooking and to produce hot water for cleaning purposes. Long-term

care and hospitality customers typically have higher water heating loads relative to other commercial business groups to accommodate domestic hot water heating requirements and on-site laundering. The remaining commercial business groups have load profiles typically driven by space heating requirements and represent a greater proportion of the small customer segment.

6. Energy efficiency, and natural gas efficiency are not top of mind for most commercial business customers. Operating cost management, attracting/retaining investors and/or tenants as well as health, comfort, and safety improvements all out-rank energy efficiency in terms of prioritization. As a result, often the optimal time to influence these customers to pursue an energy efficiency opportunity is at the time of equipment replacement, at which point financial and technical resource constraints associated with identifying, quantifying and justifying any incremental costs associated with the higher efficient equipment must be overcome.

7. The MURB segment consists of multi-residential buildings (typically buildings consisting of seven or more self-contained units). MURBs represent 8% of accounts and 26% of consumption across the portfolio. Although Low Income multi-residential buildings are technically included in this segment, due to their unique needs and barriers, Low Income customers are addressed separately in Enbridge Gas's Low Income Program described in Exhibit E, Tab 1, Schedule 3.

8. Multi-Residential buildings typically have significant domestic water and space heating loads to accommodate the comfort and general needs of residents. The largest savings opportunities in multi-residential buildings are associated with improvements to core facility equipment such as centralized domestic hot water, space heating and ventilation systems.

9. Similar to the commercial business segment, cost management, attracting/retaining residents as well as health, comfort and safety improvements all trump energy efficiency in terms of prioritization. Financial and technical resource constraints must also be overcome to support the uptake of energy efficient equipment. For example, historical emphasis on providing incentives to support the adoption of high efficiency boilers resulted in good awareness and participation associated with boiler replacement opportunities among MURB customers. This customer group has however expressed the need for further support in identifying other means to improve efficiency and reduce energy costs, as noted on page 17 of the Ipsos report (Attachment 1).

10. The MUSH segment encompasses public buildings highly influenced by provincial, federal and municipal objectives, budgets, guidelines and standards. Types of buildings within this segment include government owned buildings, universities, schools and hospitals. MUSH customers represent 3% of accounts and 17% of consumption across the commercial customer portfolio.

11. Similar to the commercial business segment, heating load requirements vary by sub-segment. Hospitals and university campuses typically have significant space and water heating requirements, with many larger facilities having on-site Combined Heat and Power (“CHP”) units and complex steam systems. Schools primarily use natural gas for space heating purposes. Finally, load profiles for government owned facilities can range significantly based on the building type, which includes, among others, office buildings, fire stations, correctional facilities, recreational facilities, army bases, and wastewater treatment plants.

12. Although return on investment associated with the implementation of energy efficiency improvements remains an important priority for customers within the MUSH segment, there is generally a greater acceptance to consider projects with

longer payback periods if doing so also supports the achievement of other policy goals, for example addressing sustainability objectives, see Attachment 1, page 48.

13. Decision-making for most MUSH facilities is most often centralized, with those responsible for planning, prioritization and project management typically overseeing multiple sites. Most often these customers will have agents and engineering firms who are contractually consulted to service energy systems throughout building portfolios.

14. Despite the desire to reduce emissions, the MUSH segment continues to face a variety of barriers to implementing efficiency projects including budgetary limitations as well as technical knowledge and internal resource constraints, see Attachment 1, pages 55 to 67.

15. Customer size is an important consideration in assessing how best to engage with commercial customers. Although there are unique characteristics associated with the commercial segments described above, one common element in analyzing historical results is the lower level of participation associated with customers who consume less than 100,000 m^3/year. In fact, during the 2015-2020 Multi-Year DSM Plan, while approximately 19% of commercial accounts who consume more than 100,000 m^3/year participated in DSM, only 2% of smaller commercial accounts participated.

16. Larger customers consuming more than 100,000 m^3/year represent 5% of commercial accounts but 57% of annual commercial consumption. Historically, projects from this group of customers have been the most cost-effective among commercial results. Although savings potential associated with each small account is significantly less (approximately four to five times smaller than larger accounts), these customers in aggregate account for 43% of annual consumption volume in the

commercial market, and therefore represent significant potential. This being said, savings results cannot possibly be achieved as cost-effectively as the larger projects more typical of larger customers.

17. Engaging small customers can be a challenge. In the Ipsos research survey conducted in 2020 where commercial customers and associations representing commercial customers were interviewed, it was identified that “simplicity and low levels of effort and knowledge is key” to engaging smaller customers (Attachment 1, page 44). “According to associations, for mid-tier and smaller landlords, the level of support required would need to be much greater - more technical, hands on and bigger or different types of incentives – in order to increase uptick in program participation” (Attachment 1, page 17). Considerable effort has been placed on exploring and proposing new offerings and delivery channels to better cater to the needs of this hard to reach, small commercial customer group.

<u>Key Market Actors</u>

18. Offerings are delivered to larger commercial customers directly by Enbridge Gas Energy Solutions Advisors (“ESA”s). The importance of the role of the ESA in driving customer participation was specifically identified in the Ipsos 2020 Commercial qualitative research, “One of the most important elements in driving likelihood to participate in Enbridge Gas programs was about the relationship” (Attachment 1, page 67). ESAs establish long term relationships with building owners, property managers and facility operators to support them in identifying, prioritizing and implementing both capital and operational efficiency upgrades to assist with energy management.

19. Service providers such as contractors and engineering firms are a key point of contact and source of energy efficiency information for customers. Collectively they have a broad reach, interacting with customers at crucial times, and often when

equipment replacement and/or procurement is needed. They can therefore be engaged to promote energy efficiency and encourage customers to leverage DSM programs. Additionally, these service providers also help to facilitate project submissions and manage program administrative details for their customers. Therefore, in its ongoing efforts to more effectively engage smaller, harder to reach customers, Enbridge Gas will continue to enhance its relationships with these channels as they represent a more cost-effective means to do so.

20. Retailers, distributors and manufacturers provide a marketplace for customers and contractors to purchase technologies including those that may improve energy efficiency. In some cases, the direct transactional environment provides an opportunity for Enbridge Gas to offer technical training and point-of-purchase rebates that can help to encourage higher efficiency uptake through a simplified customer experience.

Barriers

21. The primary barriers hindering program participation for commercial customers include challenges with market awareness, limited interest from customers and service providers as well as customers not having the ability to participate given competing priorities.

Market Awareness

22. The qualitative research conducted by Ipsos in 2020 revealed that “while awareness of energy efficiency opportunities and Enbridge Gas available programs is high among public institution stakeholders, awareness is lower or can fluctuate among Office, Retail and MURB, even among some larger real estate property owners and managers” (Attachment 1, page 8).

23. Increased awareness in the public sector is attributable to having a single decision maker over multiple properties. Customers within this segment are also more proactive in pursuing opportunities that advance sustainability objectives and reduce operational costs.

24. Enbridge Gas will address market awareness within the Commercial program through the following avenues:
   - Enhancing engagement efforts with service providers through training, educational initiatives and sales support tools that will allow them to actively promote commercial offerings to customers not traditionally targeted by ESAs to broaden awareness and reach.
   - Advancing collaborative promotional efforts with the IESO, trade associations, municipalities, and other key stakeholder groups to drive further awareness of program offerings.

Market Interest

25. With the exception of the MUSH segment, energy efficiency, and in particular natural gas efficiency is not a priority for most commercial customers. As indicated above, cost cutting, occupant comfort, and safety typically trump energy efficiency in terms of priorities. There is also perceived risk associated with installing new technologies in relation to how they will perform, and potential operational and maintenance challenges over time.

26. Enbridge Gas will address this barrier by developing and promoting 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. These profiles will also highlight industry best practices to help dispel risk perceptions associated with adopting high-efficiency measures.

27. Energy efficiency is not necessarily a priority for service providers. Their focus is on completing the sale. The added paperwork and requirements associated with DSM participation can be viewed as an administrative burden that only serves to complicate the sale.

28. Enbridge Gas will address this barrier by:

- Continuing to work with service providers to find that appropriate balance between overly burdensome administrative requirements relative to offering participation criteria.
- Enhancing the value of offerings to better appeal to service providers by providing sales support tools, and ensuring financial incentives are lucrative enough to encourage service providers to up-sell to higher efficiency equipment.
- Exploring alternative delivery channels, for example, the Midstream offering which could help reduce the perceived administrative burden downstream offerings can have on service providers.

Ability to Participate

29. Time, technical knowledge, and limited resources from a financial and personnel perspective represent challenges for many commercial customers to participate in the program.

30. Although large customers are more likely to have a dedicated resource who can support energy efficiency projects, they continue to face challenges identifying and quantifying projects to develop a business case that justifies investment.

31. For smaller customers, these barriers are even more pronounced. Smaller customers are less likely to have a resource who can actively engage with an ESA. Furthermore, even in cases where opportunities for energy savings are presented,

resource constraints in terms of financing and sourcing equipment for procurement and installation present a hurdle.

32. Enbridge Gas will address this barrier by:

- Providing technical support and tools to help customers identify and quantify savings opportunities that incorporate natural gas, water and electric savings estimates to support a stronger business case for projects.
- Offering financial incentives to reduce the first costs associated with implementing high efficiency measures in an effort to reduce payback periods to customers.
- Expanding program offerings to incorporate more turnkey solutions that limit customer time and resource requirements as well as provide even greater incentives required for small customers to participate in the program offering.

Commercial Program Proposal

33. Enbridge Gas's proposed Commercial program is designed to support customers in all commercial market segments overcome key barriers to participation to increase overall natural gas savings and help manage energy bills. Some offerings have been specifically designed to address the more complex needs of larger customers, while others are intended to address the greater time, resourcing and financial barriers faced by small customers.

34. Commercial offerings targeting large customers will continue to be delivered by ESAs, working directly with them to identify, quantify, and prioritize efficiency opportunities. ESAs typically have a market segment focus and serve as subject matter experts on the related load profiles, gas using appliances, industry best practices and barriers faced by customers within the segments they serve. Due to

the more complex nature of larger facilities, the majority of projects for larger commercial customers can be expected to be through the custom offering.

35. A one-to-one internal sales approach is not practical for addressing smaller commercial customers as there are too many accounts to reasonably engage in this manner.

36. To accommodate these capacity challenges, 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. Service providers can be effective business partners acting as an extension of the utility, promoting higher efficiency at crucial decision points, such as when equipment needs replacement.

37. An expansion of the Direct Install offering is being proposed to allow more access to turnkey solutions for small customers who otherwise would not have the means to engage in energy efficiency opportunities.

38. In addition, a new Midstream offering has been 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. Although these extended delivery channels and offerings have been designed to cater to the unique needs and challenges of small commercial customers, they may also appeal to larger customers in some instances.

39. In the OEB letter dated December 1, 2020, the OEB specifically indicated that “Enbridge is encouraged to find ways to increase natural gas savings from its

programs by reducing free ridership."[3] Although progress has been made to improve screening processes, additional initiatives are being explored to screen out free-riders and drive incremental results in Commercial program offerings. Examples of such activities include:

- Applying harmonized approaches to project eligibility, screening and substantiation requirements that incorporate best practices from each of the previously separate utility offerings. Examples of harmonized approaches include applying common baseline assumptions for custom projects and targeting previous non-participants who are less likely to engage in energy efficiency initiatives without utility support, for specific offerings and campaigns.

- Initiating fast-feedback surveys with customers that will allow for more direct and relevant project feedback so that challenges can be identified and addressed in a timely manner. For example, these surveys should assist in exploring how efficiency uptake is occurring at a market segment level, to ascertain if certain customer groups have adopted higher standards than others.

- Consistent with the recommendation from the 2018 Natural Gas Demand Side Management Free Ridership Based Attribution Evaluation,[4] Enbridge Gas will enhance its efforts to support and engage service providers through the provision of additional training and sales/marketing support material.

40. Enbridge Gas is proposing the following offerings to address the needs of the commercial sector:

[3] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.
[4] 2018 Natural Gas Demand Side Management Free Ridership Based Attribution Evaluation, DNV. GL, (March 13, 2020), p. 24.

Offering Name	High Level Description	Key Offer Elements
Prescriptive Downstream	The Prescriptive Downstream offering will provide customers with a menu of recommended technologies that have pre-determined incentive and savings amounts, defined by facility type and equipment size. Measure uptake is typically more transactional and easily quantifiable based on pre-approved inputs and assumptions outlined in the Technical Reference Manual ("TRM").	• Customer implementation incentives • Service provider engagement and training to support delivery of offering • Energy literacy tools – i.e. case studies/technology profiles/savings calculators • Connecting customers to implementation service providers
Commercial Custom	The Commercial Custom offering is designed to encourage customers to reduce their natural gas consumption by identifying, recommending, and incentivizing energy savings projects. This offer supports measures that require site-specific inputs to calculate savings, such as complex measures with interactive effects and those that are not	• Customer implementation incentives • Opportunity identification through site walk-throughs and/or assessments • Quantification of savings • Portfolio benchmarking and prioritization of opportunities • Connecting customers to implementation service providers • Audit/metering incentives

	incorporated as part of the TRM.	
Direct Install	The Direct Install offering provides a turnkey solution, primarily aimed at engaging smaller customers unlikely to participate in other program offerings due to significant time, knowledge, and resource constraints.	Provides end-to-end services to customers including: • Identification and qualification for specific energy savings measures • Incentives to cover a substantial proportion of project cost • Pre-selection of qualified service providers to facilitate installation at customer sites
Prescriptive Midstream	The Prescriptive Midstream offering is designed to influence the upselling of selected high-efficiency technologies at the supply chain level; specifically, the mid-market actors (distributors, retailers). Savings claimed through this offering are deemed, based on approved inputs and assumptions outlined in the TRM. Prescriptive Midstream differs from Prescriptive	• Engagement at a corporate level and at a store level to increase awareness of program offering and applicable efficiency measures • Continued branch and store-level engagement, education, support and sales training on upselling energy efficiency benefits • Financial incentives to support the upselling of high efficiency measures

	Downstream and Direct Install in that influence is focused at the supply chain level as opposed to the end-use customer.	

OEB Objectives and Guiding Principles

41. The Commercial program has been designed to achieve the OEB's primary objective of "assisting customers in making their homes and business more efficient in order to help better manage their energy bills."[5] The program also supports the secondary objectives to "help lower overall average annual natural gas usage" and "play a role in meeting Ontario's greenhouse gas reductions goals."[6]

42. In addition to satisfying primary and secondary objectives, the Commercial program also addresses many of the guiding principles,[7] including:

- DSM Plans should be designed to provide opportunities for a broad spectrum of consumer groups and customer needs to encourage widespread customer participation over time and "ensure all segments of the market are reached."[8]
    - Enbridge Gas will be expanding commercial offerings and delivery channels in an effort to engage small and hard to reach customers who would otherwise face significant barriers to participate in energy efficiency initiatives.
- DSM plans should include strategies to increase the natural gas savings by targeting key segments of the market and/or customers with significant room for efficiency improvements.

[5] EB-2019-0003, OEB Letter Post 2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[6] Ibid, p. 3.
[7] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, pp. 6-8.
[8] EB-2019-0003, OEB Letter Post 2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

  - Improvements have been made to enhance free ridership screening so that resources can be allocated towards customers and projects that would most benefit from participation in the program.
  - Data-driven benchmarking initiatives will be leveraged to identify customers with the highest energy intensity levels to target for specific program offerings.
- DSM plans should minimize lost opportunities for energy efficiency and should be designed to pursue long term energy savings.
  - The continuous energy improvement approach driven by ESA to key account relationships provides a means of working with Enbridge Gas's largest commercial customers year after year to drive deeper savings.
  - Most capital measures implemented through Enbridge Gas's commercial program offerings have long measure lives of fifteen years or longer.

- Where appropriate, Enbridge Gas should coordinate DSM and electricity CDM efforts.
  - Through continued discussions with IESO, Enbridge Gas will explore joint delivery and marketing opportunities to promote commercial program offerings to customers building on current collaborations.

Commercial Custom Offering

<u>Background</u>

43. The Commercial Custom offering has been particularly effective in engaging and meeting the needs of commercial customers whose projects require more involved calculations or modelling.

44. The Commercial Custom offering also allows for implementation and quantification of projects that may contain multiple measures with possible interactive effects

where energy savings are most appropriately estimated through custom calculations.

45. Although the Commercial Custom offering has and is expected to continue to be the most cost effective and impactful offering addressing the commercial market in terms of driving gas savings results, overall cost effectiveness of the offering has been declining as a result of a variety of factors:

- Advancements in codes and standards have increased baseline assumptions, reducing claimable savings.
- Higher incentives are required to compensate for the increased incremental costs associated with supporting the adoption of higher efficient measures as a result of baseline adjustments driven by advancements in codes and standards.
- The 2018 custom Net-to-Gross (“NTG”) study estimated higher free ridership results than earlier evaluations, impacting overall net results and reducing the cost effectiveness of the offering.

46. Improvements in net natural gas savings results associated with the Commercial Custom offering will be driven by increased efforts to manage free ridership in addition to stepping up efforts to engage a broader group of customers, especially across the Union rate zones, where historical participation in the Commercial Custom offering has been more limited.

<u>Objective</u>

47. The goal of the Commercial Custom offering is to encourage customers to reduce natural gas consumption by identifying, recommending, and incentivizing energy savings projects. This offering provides technical and financial support for more complex projects that are better suited to site-specific analysis to assist customers in making informed decisions that drive savings.

Target Market

48. The Commercial Custom offering is targeted to commercial customers across the Enbridge Gas franchise, subject to eligibility details outlined below.

Offering Details

49. Enbridge Gas ESAs will continue to be the primary delivery channel for the offering. They have long-standing relationships with large customers, key accounts and strategic business partners such as engineering firms and service providers, and work directly with the market to develop custom solutions that meet the particular operational and budgetary needs of customers.

50. Key elements of the Commercial Custom offering design include:

- Knowledge Development – Customers have access to a variety of case studies, quarterly updates, and workshops to create awareness and interest in opportunities and highlight industry best practices.
- Opportunity Identification – ESAs provide estimated project savings calculations to customers and strategic business partners that can be used to develop a business case in support of the project.
- Implementation planning – ESAs work with customers on implementation plans and connect them with qualified vendors.
- Financial incentives – Monetary support helps reduce upfront costs associated with identifying, measuring, procuring, and installing high-efficiency measures.

Eligibility Criteria

51. To be eligible for the offering, a participant must be an Enbridge Gas commercial customer.[9]

[9] Commercial customers include MURBs, MUSH and other non-industrial businesses. Industrial customers and Low Income Multi-Residential customers are targeted through the Industrial and Low Income Programs respectively.

Incentives/Enablers[10]

52. There are two types of incentives available to participants: opportunity identification incentives and project implementation incentives. Where deemed appropriate by an ESA, financial incentives to cover up to 50% or a maximum of $10,000 for costs associated with third-party audits, studies and metering (for example, air balance testing and steam trap studies) are available to help customers identify and quantify savings opportunities and to justify project implementation.

53. Implementation incentives are calculated on a project basis and are based on estimated natural gas savings associated with the implementation of efficiency measures. Enbridge Gas proposes an incentive of $0.25/m^3 of natural gas saved to cover up to 50% of the incremental project cost to a maximum of $50,000 per project.

Considerations for Continuous Improvement

54. Efforts for continuous improvement will primarily focus on measures to improve free ridership, as outlined in the commercial sector strategy above, and broadening market reach by expanding market delivery approaches of commonly implemented, less complex measures.

55. There are a variety of applicable commercial measures among large and small to mid-sized customers that require too many inputs to be practically developed into a sub-doc. To simplify the custom calculation process for these measures, Enbridge Gas has developed standardized calculators that calculate savings based on a combination of internally approved assumptions and site-specific inputs. To broaden

[10] Incentives are subject to change and may evolve over time based on changing market needs. Limited time increased incentive offers (LTOs) may also be made available to customers from time to time to drive adoption of specific measures and/or behaviours.

market reach, Enbridge Gas is working to develop an external facing tool and training for service providers to support select measures.

Metrics

56. The metric for the Commercial Custom offering is net annual natural gas savings, measured in m^3.

Gross Measurement

57. This offering will use several customized approaches as the basis for natural gas savings (m^3) gross measurement, examples include engineering calculations and energy modelling, as determined appropriate by Enbridge Gas technical experts. For commonly implemented measures, standard calculators have been developed such as e-tools to ensure that common baseline assumptions and calculation methodologies are applied across similar project types.

Impact Evaluation & Verification

58. The most recent NTG study examining the Commercial Custom offering conducted by the Evaluation Contractor ("EC") was for the 2018 program year and was conducted for the separate EGD and Union Gas rate zone offerings. Enbridge Gas recommends that the EC conduct a NTG study (including both free ridership and spillover) for this offering ideally following the first year of program implementation.

59. Enbridge Gas also recommends that repeated NTG studies are conducted for the offering throughout the term of the plan, however, Enbridge Gas recommends that such studies are not conducted any more frequently than every 2 years in an effort to minimize participant survey fatigue. The focus of the studies should be based on areas where the offering design has been changed.

60. Furthermore, NTG studies should provide detailed and transparent information at a segment level, in order to provide Enbridge Gas with program design information that can be actioned. Enbridge Gas also submits that it is critical that NTG studies are executed as close to project completion as practical, to ensure relevant and timely customer feedback information is obtained. When the execution of NTG studies are delayed, employee turnover at the project site can impact the quality of the responses and the study.

61. Enbridge Gas also recommends that third-party verification studies, also referred to as CPSV studies, are appropriate for this offering, since most gross measurement claims are developed by Enbridge Gas. Since Enbridge Gas has been conducting gross measurement claims for several years, and has been engaged in the EC's review of the utility's gross measurement savings claims, Enbridge Gas submits that less rigorous, multi-year CPSV evaluations are appropriate in an effort to reduce participant survey fatigue and lower evaluation costs. The EC provided similar recommendations in its 2021-2022 DSM EM&V Plan:[11]

62. "The annual CPSV process has historically included an extensive evaluation effort to verify the savings achieved by custom DSM programs in C&I facilities. While the level of evaluation is warranted due to the portion of the gross cumulative portfolio savings represented by these programs (50% in 2018), consistent year-over-year verification results have demonstrated that a less rigorous process could be employed to provide similar value. The EC recommends that future evaluations implement a multi-year rolling sample methodology to determine custom C&I gross savings."[12]

[11] 2021-2022 Natural Gas Demand Side Management Evaluation, Measurement, and Verification (EM&V) Plan, DNV GL (February 4, 2021), pp. 6-7.
[12] Ibid.

Process Evaluation

63. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Direct Install Offering

Background

64. The Direct Install offering was first introduced in 2016 as a means of engaging small industrial and commercial customers who had little to no previous participation in DSM programming. The offering helped these hard to reach customers overcome key barriers to participation by providing a turnkey solution whereby contracted service providers would engage with target customers, quote, and install an efficiency measure in their facilities. The offering also provided a significant financial incentive paid directly to contracted service providers in order to reduce the upfront financial burden on participants.

65. The Direct Install offering demonstrated success in engaging hard to reach customers and driving results; however, due to TRM revisions to the air curtain measure in 2020, cost effectiveness of the offering has declined.

66. Lessons learned from delivering the Direct Install offering include the following:

- A high level of customer engagement is required by service providers, with multiple touch points to gain customer commitment to participate. Enbridge Gas branded marketing collateral is an example of a tactic to support in-field efforts of service providers in assuring customers of the legitimacy of the offering.

- Even with increased levels of incentives, a clear business case must exist as customers may still require approval for capital despite their minimal contribution. Enbridge Gas has worked with its contracted service providers to ensure incentive levels reflect appropriate payback periods to customers.

- Expanding the network of service providers in the delivery of this offering helps to prevent market disruption and ensure competitive pricing. Enbridge Gas will expand its network of service providers as it contemplates adding more measures through this offering.

Objective

67. The Direct Install offering is a turnkey solution that engages small commercial and industrial customers to implement energy savings projects that they otherwise would not have undertaken without the enhanced support and incentives provided through the offering.

Target Market

68. This offering is targeted primarily to smaller commercial and industrial customers; particularly independently owned and operated businesses, most of whom have never previously participated in a DSM offering.

Offering Details

69. The Direct Install offering is designed to address the additional barriers faced by smaller customers to participating in traditional DSM programs such as lack of awareness, lack of comfort with new technologies, and lack of financial resources and internal capacity.

70. These barriers are addressed by providing customers with higher incentives and a turnkey solution requiring little time, effort, or internal expertise on the part of the customer.

71. To facilitate this turnkey solution, Enbridge Gas equips contracted service providers with the training and sales support tools to identify, qualify, quote, and install eligible measures.

72. The offering was initially focused on a specific set of measures, including:
- Air Curtains – Shipping Doors
- Dock Door Seals
- Demand Control Kitchen Ventilation

73. Enbridge Gas is planning to expand its Direct Install measures to include destratification fans, pedestrian-door air curtains and add-on ventilation measures. The addition of these measures present opportunities to grow participation and results as well as offer customers more measure opportunities during engagement. It should be noted, however, the proposed measures are generally less cost effective than those initially offered. Adding measures will also require expanding the network of service providers delivering the offering, which will require more administration to manage. Overall, these changes are expected to increase participation and results, but also reduce cost effectiveness of the offering over time.

Eligibility Criteria

74. To be eligible for the offering, a participant must be an Enbridge Gas commercial or industrial customer[13] with no past DSM participation in the last three program years.

[13] Commercial customers include MURBs, MUSH and other non-industrial businesses. Industrial customers are non-residential customers involved in the production and/or enhancement of mercantile goods and/or the cultivation of plants and/or livestock. Large Volume rate classes T2 and R100 in Union rate zone are ineligible for

75. Qualifying products and customers must meet requirements as outlined in the current version of the TRM applicable to the program year.

Incentives/Enablers

76. The Direct Install offering has been expanded to reach customers with additional measures. Proposed incentive levels have been established to cover, on average, approximately 75-80% of the incremental equipment cost, as outlined in the TRM. For each measure, the incentive will cover a portion of the installation costs, up to approximately 50%.[14]

77. In addition, the offering will include a free site assessment to identify other energy saving opportunities.

Metrics

78. The metric for the Direct Install offering is net annual natural gas savings, measured in m^3.

Gross Measurement

79. The offering will use the TRM as the basis for natural gas savings (m^3) gross measurement. Projects must meet requirements as outlined in the version of the TRM applicable to the program year.

this offering and are supported directly through the Large Volume program. Low Income Multi-Residential customers are not eligible.

[14] Incentive details are provided as currently contemplated, Enbridge Gas routinely examines and adjusts incentive amounts in response to opportunities and market conditions, and in an effort to maximize program performance and results over the course of the Multi-Year term.

Impact Evaluation & Verification

80. Enbridge Gas recommends that the EC conduct a NTG study (inclusive of both free ridership and spillover) for this offering, ideally following the third year of program implementation (and no earlier than the second year), to allow time for new offering components to be implemented.

81. Enbridge Gas also recommends that regular NTG studies are conducted for the offering throughout the term of the plan. The focus of the studies should be based on areas where the offering design has been changed.

Process Evaluation

82. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Prescriptive Downstream Offering

Background

83. Prescriptive measures have predictable deemed savings across a variety of technologies and are therefore offered to customers through a simplified application and approval process. Since savings and incentives are fixed, the Prescriptive Downstream offering is a transactional, straightforward, and easily verifiable approach that generates savings for Enbridge Gas's customers.

84. Overall results and cost effectiveness of the Prescriptive Downstream offering have decreased over time as advancements in codes and standards have resulted in the need to adjust and in some cases eliminate measures from the TRM. Furthermore,

the 2018 NTG study estimated results demonstrated much higher free ridership rates for several prescriptive measures than previous studies, significantly reducing claimable savings and overall cost effectiveness associated with the offering. Enbridge Gas will continue to focus on initiatives to improve NTG results, as articulated in the commercial sector strategy above.

85. Among the most impactful of the lessons learned to increase reach, participation and overall natural gas savings results associated with the offering include the need to:

- engage service providers to effectively represent the offering including efficiency options available to the customer at crucial points in the project decision-making process, such as when equipment needs replacement.
- ensure customers are presented with an efficiency opportunity and have the necessary information to generate a simple business case to support the project.

86. To address these lessons learned, enhanced enabling initiatives to support service providers will be incorporated as part of the proposed Prescriptive Downstream offering. Training and sales support tools, including the delivery of workshops and webinars as well as access to marketing collateral, case studies, technical spec sheets and online savings calculators will be available to service providers to ensure they have the necessary knowledge, information and means to properly promote the offering and efficiency opportunities to customers. Furthermore, an increase in financial incentives has been applied across most Prescriptive Downstream measures, making the offering more appealing for service providers to present to customers. Finally, the training and tools provided to service providers will enable them to support customers in developing simple business cases. Self-serve tools, such as online assessments will also continue to be available to customers, allowing them to identify potential savings and incentives associated with implementing Prescriptive Downstream measures.

Objective

87. The Prescriptive Downstream offering is designed to engage commercial and industrial customers to adopt a suite of prescriptive and quasi prescriptive measures to enhance energy efficiency and realize natural gas savings in their buildings.

Target Market

88. The Prescriptive Downstream offering is open for participation to all commercial and industrial customers.

Offering Details

89. The Prescriptive Downstream offering will continue to be delivered to customers through both an internal sales team who work directly with customers; including key accounts, municipalities and larger commercial customers, as well as through an enhanced focus on working with service providers that will allow for a broader reach than could be accomplished by an internal sales force alone.

90. Key elements of the Prescriptive Downstream offering design include:
- Knowledge Development – Customers and service providers have access to case studies, collateral, and workshops to create awareness and interest in Prescriptive measures and the offering.
- Implementation planning – ESAs can connect customers with qualified vendors.
- Financial incentives – Monetary support helps reduce upfront costs associated with procuring and installing high-efficiency measures.

Eligibility Criteria

91. To be eligible for the offering, a participant must be an Enbridge Gas commercial or industrial customer.[15]

[15] Commercial customers include MURBs, MUSH and other non-industrial businesses. Industrial customers are non-residential customers involved in the production and/or enhancement of mercantile goods and/or the

92. Qualifying products and customers must meet requirements as outlined in the current version of the TRM applicable to the program year.

Incentives/Enablers

93. The Prescriptive Downstream offering is transactional in nature to encourage broad participation through a simplified process. The offering reduces the incremental cost barrier between the higher efficient equipment and standard or code required equipment. Proposed incentive levels for the Prescriptive Downstream offering have increased to cover, on average, approximately 40% of the incremental equipment cost, as outlined in the TRM.

94. Table 2 outlines the proposed incentive levels per measure:[16]

Table 2

Prescriptive Downstream Measures	2022-2027 Incentive Levels
Air Curtains - Pedestrian & Shipping Door	\$650-\$8,750
Dock Door Seals - Compression & Shelter	\$950-\$1,650
Condensing Make-Up Air Unit	\$700-\$14,000
Demand Control Kitchen Ventilation Unit	\$1,200-\$9,250
Ozone Laundry	\$7,000-\$15,000
Destratification Fans	\$2,500
Demand Control Ventilation with CO2 Sensors	\$500
Energy Recovery Ventilator	\$150-\$12,000
Energy Recovery Ventilator Improved Effectiveness	\$50-\$12,000
Heat Recovery Ventilator	\$75-\$8,000
Heat Recovery Ventilator Improved Effectiveness	\$25-\$8,000

cultivation of plants and/or livestock. Large Volume rate classes T2 and R100 in Union rate zone are ineligible for this offering and are supported directly through the Large Volume program. Low Income Multi-Residential customers are not eligible.

[16] Incentives are subject to change and may evolve over time based on changing market needs. Limited time increased incentive offers (LTOs) may also be made available to customers from time to time to drive adoption of specific measures and/or behaviours.

95. In some cases, special offers will also be developed for customers where the decision maker has influence over multiple sites or as a result of customers' unique needs. This includes but is not limited to:

- National Accounts/Key Accounts: Encourage customers with multiple buildings to adopt measures in multiple sites at higher efficiency levels and/or sooner than they otherwise would have.
- Tenant/Owner initiatives: Explore approaches to address opportunities for MURB and Office/Property Management companies where drivers also include tenant retention, comfort and green initiatives.

<u>Metrics</u>

96. The metric for the Prescriptive Downstream offering is net annual natural gas savings, measured in m^3.

<u>Gross Measurement</u>

97. The offering will use the TRM as the basis for natural gas savings (m^3) gross measurement. Projects must meet requirements as outlined in the version of the TRM applicable to the program year.

<u>Impact Evaluation & Verification</u>

98. Enbridge Gas recommends that the EC conduct a NTG study (inclusive of both free ridership and spillover) for this offering. The most recent NTG study conducted by the EC was for the 2017 program year and was conducted for the separate EGD and Union rate zone offerings. Changes to the offering have been made since then to improve NTG. The recommended area of focus for the study includes:

    - Demand Control Ventilation
    - Energy Recovery Ventilators
    - Air curtains and dock door seals
    - Measures that weren't assessed in the 2017 study

99. Enbridge Gas also recommends that regular NTG studies are conducted for the offering throughout the term of the plan. The focus of the studies should be based on areas where the offering design has been changed.

Prescriptive Midstream Offering

Background

100. The Midstream offering was first explored by Union rate zone in 2018 in response to feedback from the Midterm Review during the 2015-2020 DSM Plan. The pilot project initially targeted the food service segment to gain experience in the Ontario marketplace and understand barriers to applying a midstream approach. Following utility integration, in Q3 of 2019, Enbridge Gas developed and launched a province wide midstream offering targeting a selection of commercial foodservice and HVAC measures.

101. Midstream offerings direct incentives to “mid-market” actors in the supply chain such as equipment distributors and/or retailers. This stands in contrast to downstream offerings, which direct incentives to end-users. Prescriptive measures with broad applicability and little to no equipment customization requirements are necessary for a midstream offering because distributors and retailers do not have access to project specific inputs to accommodate more customized measures.

102. Midstream offerings are designed to influence the sales practices of participating equipment suppliers and, over the long term, influence their stocking practices. These equipment suppliers have a broad customer reach, creating potential to drive higher uptake of high efficiency products. In particular, a midstream offering with broad market coverage and targeting common measures is a compelling opportunity to influence hard to reach customers when they need to replace equipment.

103. Based on the experience to date, Enbridge Gas's Prescriptive Midstream offering is showing promise at engaging the supply chain and reaching smaller customers who have not previously participated in DSM programming.

Lessons Learned

104. Although the offering has been in market for a relatively short period of time, the experience has provided key lessons that have informed the proposed new offering design. Key lessons learned are the following:

- The TRM substantiation documents underpinning the Midstream Prescriptive offering must be simple and sufficiently broad to apply to a midstream model. Prescriptive substantiation documents with segment restrictions and quasi-prescriptive measures will be restricted to downstream offering models where more effort is required to identify savings and/or targeting is necessary. Going forward, Enbridge Gas is conducting prescriptive research with a focus specific to the needs of this type of offering.

- Considerable time and effort are required to engage, on-board, and sustain participating mid-market actors. Distributors/retails must see the value to justify the commitment to operationalize the offering, which includes updating systems and payment processes and training sales staff.

- Limited measures and low sales volumes of high efficiency equipment can present a challenge for participating distributors/retailers to sustain their focus. An example of how Enbridge Gas is addressing this barrier is through coordinated delivery with the IESO. In 2020, the IESO introduced midstream incentives for select electric food service measures to participating distributors/retails for inclusion in Enbridge Gas's Midstream offering. Offering qualifying gas and electric measures appealed to participating distributors/retailers by providing opportunity for higher sales volumes and deeper engagement.

- As the Midstream offering is new to the market, initial savings results do not yet reflect the full potential for this offering. As such, the relative high program delivery costs, have an impact on cost effectiveness. Enbridge Gas expects that over time cost effectiveness should improve as the offering continues to grow.

<u>Objective</u>

105. The Prescriptive Midstream offering is designed to incent mid-market actors, like distributors and retailers to influence the promotion and sale of high efficiency products to commercial and industrial customers.

<u>Target Market</u>

106. The Prescriptive Midstream offering targets mid-market actors like distributors and retailers of the eligible equipment.

<u>Offering Details</u>

107. The Prescriptive Midstream offering is delivered through a contracted vendor. The vendor identifies and enrolls eligible distributors and retailers, and then provides the necessary training to effectively promote and upsell energy efficient equipment. The vendor also supports offering administration through their online portal. The portal is an essential component of the offering, providing customer/product validation, Qualified Product Lists (“QPL”), incentive processing, dashboard metrics and performance tracking. Key offering activities are outlined below:

- Outreach and enrollment – Targeting and encouraging distributors and retailers to enroll in the program offering through direct outreach and recruitment.

- Training and ongoing engagement – Training and customized marketing materials associated with the offering and efficiency measures are provided to engage distributor/retailer sales staff in supporting the offering and promoting eligible measures. Ongoing support is also provided to ensure the offering remains a focus for the distributor/retailer sales team.

- Program management and tracking – Participating distributors/retailers are provided with access to an online portal that simplifies the process of project qualification, submission, and incentive/performance tracking.

<u>Eligibility Criteria</u>

108. To be eligible for the offering: Equipment must be installed at an Enbridge Gas Commercial or Industrial[17] premise.

109. Qualifying products and customers must meet requirements as outlined in the current version of the TRM applicable to the program year.

<u>Incentives/Enablers</u>

110. Table 3 outlines the incentives by measure, per unit:[18]

[17] Commercial customers include MURBs, MUSH and other non-industrial businesses. Industrial customers are non-residential customers involved in the production and/or enhancement of mercantile goods and/or the cultivation of plants and/or livestock. Large Volume rate classes T2 and R100 in Union rate zone are ineligible for this offering and are supported directly through the Large Volume program.
Low Income Multi-Residential customers are not eligible.

[18] Incentive details are provided as currently contemplated, Enbridge Gas routinely examines and adjusts incentive amounts in response to opportunities and market conditions, and in an effort to maximize program performance and results over the course of the Multi-Year term.

Table 3

Prescriptive Midstream Measures	Distributor/Retailer Incentive ($/per unit)
HVAC	
Condensing Water Heaters	$450
Condensing Unit Heaters	$1,000
Food Service	
ENERGY STAR® Fryers	$750
ENERGY STAR Steam Cookers	$1,000
High-Efficiency Under-Fired Broilers	$750
ENERGY STAR Convection Oven	$750
ENERGY STAR Rack Ovens single	$750
ENERGY STAR Rack Ovens double	$900

Incentives were established in consultation with the contracted delivery agent and participating mid-market actors.

Metrics

111. The metric for the Prescriptive Midstream offering is net annual natural gas savings, measured in m^3.

Gross Measurement

112. The offering will use the TRM as the basis for natural gas savings (m^3) gross measurement. Projects must meet requirements as outlined in the version of the TRM applicable to the program year.

Impact Evaluation & Verification

113. Enbridge Gas recommends that the EC conduct a NTG study (inclusive of both free ridership and spillover) for this offering, ideally following the third year of program implementation, and no earlier than the second year of program

implementation. This will allow time for new offering components to be implemented and ramped up.

114. Enbridge Gas also recommends that regular NTG studies are conducted for the offering throughout the term of the plan. The focus of the studies should be based on areas where the offering design has been changed.

115. While the details of a NTG study for this offering requires attention and discussion with the EC and EAC, Enbridge Gas submits that the focus of a study for this type of mid-market offering must be based on vendors, rather than customers/end-users. This offering is designed to interact with and influence vendors, and as such, a traditional NTG study focused on customers/end-users would not be supported by Enbridge Gas.

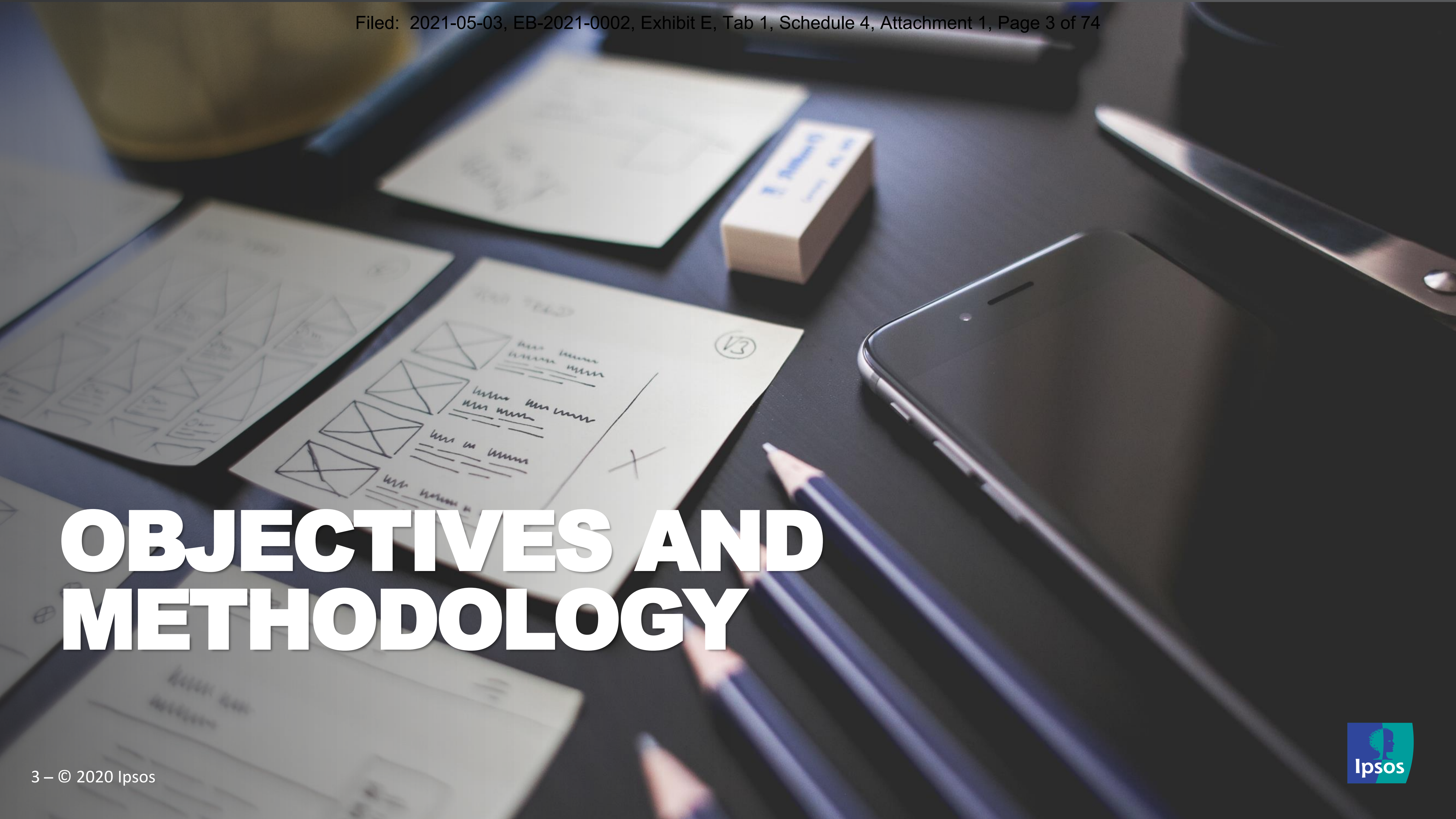
ENBRIDGE GAS COMMERCIAL NEXT GEN DSM PLANNING

STAKEHOLDER ENGAGEMENT

Report of Qualitative Research Findings

October 2020

CONTENTS



OBJECTIVES AND METHODOLOGY

Background and Methodology

Enbridge Gas wishes to engage with its key commercial stakeholders, including various Associations, Customer Representatives and Members, Business Partners, Universities, School Boards and Hospitals, Municipalities, and individuals in the Office, Retail & MURB (Multi-Unit Residential Building) sector in order to inform its Next Gen DSM planning activities.

The objectives outlined by Enbridge Gas are to gain insights on key issues and priorities to inform the Commercial Sector Strategy and suite of offerings.

Qualitative research was conducted from August 13, 2020 to October 8, 2020. A series of 33 interviews and 3 focus groups were conducted, as broken out in the table below. Interviews and focus groups were conducted by phone or MS Teams and were 60 to 120 minutes in length.

AUDIENCE	# OF PARTICIPANTS	TYPE OF FIELDWORK
Association, Office, Retail, MURB and Business Partner Representatives (Direct Customer and Representatives of Associations)	13	Interviews
University, School Board, Hospital Representatives (Direct Customer and Representatives of Associations)	8	Interviews
Municipal Representatives	23	Interviews and Focus Groups

About the Stakeholders

Association, Office, Retail, MURB and Business Partner Representatives: These individuals are representatives of industry associations, customers, or both. This group also includes business partners.

- **Association and Customer Representatives**: These are individuals who work for an industry association, and who have deep knowledge of their members' activities, needs and accomplishments as it relates to energy management and energy efficiency projects. We also spoke to those who have customers or clients whose products and services enable energy efficiency projects.
- **Direct Customer**: These are individuals in their organization who have been tasked with sustainability and/or energy management. They work for national or global companies with large portfolios of various types of buildings (Office, Retail and MURBs).
- **Business Partners**: These are vendors, or representatives of vendor associations, who provide natural gas products and services to their customers, primarily in the installation or upgrading of equipment. However, these are not always for energy efficiency projects specifically.

University, School Board and Hospital Representatives: These are individuals with oversight over energy management or a broader buildings and facilities remit. A number also held positions in associations representing their sector on the issue of energy or were hired to support multiple organizations within their sector to access incentive programs.

Municipal Representatives: These are municipal employees who oversee energy management and/or conservation for municipally owned buildings, either as a discrete role or as a function of a larger role.

About Qualitative Research

We identify **five basic elements** to qualitative analysis:

Consensus perspectives that reflect the view of most participants; areas of wide agreement without much counter point (most, many, several)

Conflicting or polarizing perspectives where views are much more divided (some vs. others)

Minority perspectives, often expressed by one or two participants as a counterpoint to a consensus viewpoint (a few, a couple, mentions)

Verbatim commentary, providing examples of what participants actually said during a discussion

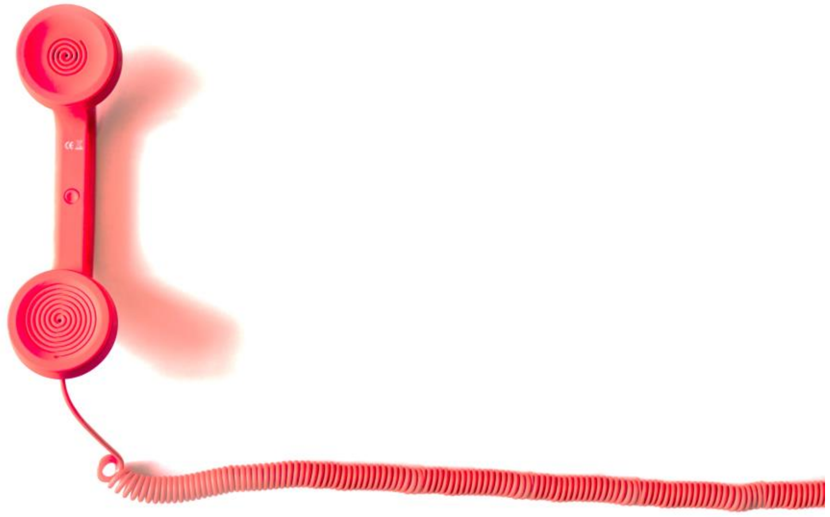
External context, such as recent public issues widely reported in the media or the results of the quantitative research that may help shed light on why participants respond in the way they do

The qualitative methodology for this stakeholder engagement means that it is not a representative sample, but rather provides directional, thematic and insight-driven findings in this domain. The conclusions drawn and opinions expressed are those of the researchers.

KEY THEMES

awareness

While awareness of energy efficiency opportunities, and Enbridge Gas' available programs, is high among public institution stakeholders, awareness is lower or can fluctuate among Office, Retail and MURB, even among some larger real estate property owners and managers. As such, building awareness and providing education about opportunities is an important building block in ensuring greater uptick of participation in Enbridge Gas programs.



outreach

Many would like Enbridge Gas to proactively reach out to them and / or their clients, members and customers, to inform them of Enbridge Gas' programs and services – most are familiar with incentives generally but lack detailed knowledge or may not be aware of all available opportunities. Further, any items of interest such as Amendment 15 could be disseminated to them, in order to build awareness and provide support. The merger with Union Gas provides new outreach opportunities to institutional customers via province-wide bodies such as OAPPA and OASBO.

relationship building

Some in the private sector (MURBs, Retail, Office) are not aware of a direct relationship with an individual at Enbridge Gas, or lack an ongoing and identifiable business relationship with an individual who they feel they can turn to for advice or support on any natural gas conservation projects. For these stakeholders, building a more high-contact relationship would be welcome.

stretch goals

For larger Office, Retail and MURB representatives and within municipalities, universities, school boards, and hospitals, much of the “low-hanging fruit” has already been accomplished, and there is desire for offerings beyond incentives for replacing aging equipment, such as support for retrocommissioning and creating operational efficiencies. For “mid-tier” property owners and managers who may not have the capital required for the replacement of equipment, targeted incentivization or operational support might be considered.

Finding opportunities within existing properties – as opposed to new builds where energy efficiency is part of the design – should also be a major consideration in any future programming.

selection

Some would find aggregation of various vendors and partners to be useful and having Enbridge Gas vet these companies or individuals would be the most valuable function, as this would ensure that they are trustworthy and reliable.

However, business partner representatives would like reassurance of neutrality / independence. This reassurance is less relevant for institutional stakeholders who have strict procurement processes in place.

carbon consciousness

Awareness is growing among tenants, landlords, property managers, and public institutions of their carbon footprint and emissions, and their impact on the environment – it is a concern that is becoming increasingly mainstream. This new consciousness has implications in a number of ways – everything from decisions to lease a space, to net zero aspirations, and in the design of new builds. In other words, the appetite to reduce natural gas consumption is there and will likely continue to grow in terms of interest and priority. The negative impact of carbon on costs is also a key consideration and efforts to reduce carbon consumption are also driven by the desire to control costs.

trust

Stakeholders views on customers' trust of Enbridge Gas are mixed. While some believe that there are high levels of trust in utilities and that they bring credibility in terms of conservation efforts and vendor recommendations, there are those who believe that levels of skepticism are high among customers who are unaware of why the utility would want to promote conservation for a product they are supplying.

Direct customers included in the research view Enbridge Gas favourably based on positive experiences and these stakeholders believe that Enbridge Gas brings credibility to conservation programs and vendor recommendations.

size matters

Many findings differed depending on the size of the property owner or public institutions. According to associations, smaller and mid-sized “mid-tier” players have very different needs, considerations and dedicated staffing resources for energy efficiency programs than large Office, Retail and MURBs or public institutions. Hence, programs for both should be treated accordingly, and tailored to meet these players where they are.

KEY TAKEAWAYS

Key Takeaways: Business Partners, Office, Retail and MURB

1. Most large Office, Retail and MURB property owners and managers have internal resources who oversee energy management. Providing a dedicated Enbridge Gas account manager with whom they have a one-on-one relationship and partnership would help optimize opportunities for energy efficiency projects. According to associations, for “mid-tier” and smaller landlords, the level of support required would need to be much greater – more technical, hands on and bigger or different types of incentives– in order to increase uptick in program participation.

2. Many associate natural gas conservation with boiler replacement, and awareness of innovative technologies is lower among Office, Retail and MURB participants than with public sector participants– this is considered “low hanging fruit” while at the same time being a capital intensive undertaking. Helping to identify other types of opportunities would be relevant for both larger landlords who have already replaced boilers, and for smaller ones who may not be able to afford replacement of their current equipment.

3. Net zero emissions, and the use of alternative fuel sources, are considered by this audience to be more feasible for new builds than with existing properties, where the energy and capital intensity of new technologies, space requirements, and other barriers, make them difficult to enable.

4. Office, Retail and MURB would benefit from greater awareness and education of Enbridge Gas’ existing programs, and offerings, as current awareness tends to be centered on incentives. Even those program participants who are keenly aware of incentives, don’t necessarily know about items such as audits and technical expertise provided by Enbridge Gas – this feedback comes from both customers, and those associations who represent them.

5. Partnerships or positive working relationships between Enbridge Gas and associations, business partners, and large customers would be welcomed by all. Most see opportunities for Enbridge Gas to become more actively engaged and visible in the sector and demonstrating its commitment to the same conservation and sustainability goals of these companies and organizations. Direct outreach, relationship building, and greater collaboration would all be desired outcomes.

Key Takeaways: Universities, School Boards and Hospitals

6	The size of the organizations in this sector matters in terms of the level of effort and having specialist staff dedicated to energy consumption monitoring and energy efficiency opportunities. Saving on energy costs remains a key motivator in energy efficiency projects but increasingly environmental sustainability is part of the conversation. Available funding meanwhile remains the biggest barrier to the actualization of projects.
7	The most impactful benchmarks in driving energy efficiency projects appear to be internal commitments to reducing GHGs or energy intensity targets as opposed to external Ministry of Energy reporting requirements. Commitment is led at a senior leadership level and cascaded down to other parts of the organisation including embedding energy efficiency within the scope of new capital projects.
8	Representatives who took part in this engagement exercise are active in pursuing incentive and program opportunities. The “simplicity and straightforwardness” of Enbridge Gas programs are their unique selling point. However, these representatives’ familiarity with existing programming can be a double-edged sword for new programs being considered by Enbridge Gas: familiarity can result in comfort in participation and lead to a reluctance to participate in new programs and lead to questions on how it will link up or provide additional value to existing options.
9	Enbridge Gas should continue cultivating the relationships that already exist on the ground and take advantage of reaching more institutions through association groups, in addition to working directly with customers in this sector. Sharing of best practices already exists as well as some collaboration between higher education institutions to access funding. Coupled with the positive impressions of dealing with Enbridge Gas, there is a fertile ground to explore future collaboration with this sector.

Key Takeaways: Municipalities

10 Many municipalities have ambitious net zero or GHG reduction goals which they are at various stages and levels of working towards – while at the same time also aspiring to other sustainability goals such as water and waste reduction, and reduced electricity consumption.

11 Benchmarking is less important than in the private sector, in that although they are aware of activities of other municipalities, this is more in the spirit of collaboration and the sharing of best practices towards similar goals and outcomes.

12 There are a variety of types of municipally-owned buildings, many of which are mixed use and/or used by the public, and so flexibility needs to be provided within Enbridge Gas' programming for various types of facilities. Most municipalities are aware of Enbridge Gas' incentives although awareness of the breadth of programs and services is mixed, and perceptions vary based on relationships with account representatives. Municipalities would be appreciative of incentivization and funding of as many components of energy efficiency initiatives as possible.

13 Municipalities are interested in and open to new technologies and integrating other fuel sources in their municipally owned buildings. Some have more physical space and greater tolerance for longer payback periods which makes these more feasible than in the private sector. They keep abreast of new available technologies and are willing to pilot or try them to gauge success, from both a maintenance and economic perspective.

14 There is appetite and openness to working collaboratively with Enbridge Gas. Having a representative reach out to them directly and proactively is welcome. There are also opportunities to partner with municipalities on their existing community energy programs, in educating the general public about ways to reduce energy consumption and costs in their homes and businesses – particularly since local government is considered a trustworthy ally/source.

DETAILED FINDINGS

ASSOCIATION, OFFICE, RETAIL, MURB AND BUSINESS PARTNER REPRESENTATIVES (DIRECT CUSTOMER AND REPRESENTATIVES OF ASSOCIATIONS)

Energy Efficiency

Energy efficiency is an ongoing endeavour for stakeholders and it is an activity that takes place year-round. Specific initiatives and measures include:

- Tracking and monitoring consumption
- Maintenance of equipment and identifying operational efficiencies where possible
- The planning and implementation of energy efficiency or equipment replacement projects

Customer stakeholders have energy efficiency or consumption reduction targets in place which are tracked on an annual basis. The timing of implementation of planned projects for many is when renovations or improvements would be least disruptive to tenants.

With our portfolio, we have such a wide range of measures we like to implement, so we do like to balance it out throughout the year. When it comes to our gas side of the business, you know, if we're doing a boiler retrofit or a building automation system, we want to focus that in the summer, in the non-heating months just to make sure, you know, we don't want to have to put like backup heating or rental boilers in, or anything like that, as a cost.

Capital planning can be annual, or multi-year. For those who plan annually, there may be a certain period where planning takes place although the time of year varied by stakeholder.

Among those with multi-year capital plans, these are made when the period (2 years, a few years, 5 years) is about to cycle through again. Natural gas capital replacement projects are typically planned well in advance due to the large capital outlay required. That said, equipment can fail unexpectedly, or last longer than expected, and adjustments are made accordingly.

So basically we'd plan out five years and for example, if it would cost $1 million to replace a heating boiler, Enbridge gas boiler, you couldn't…I wouldn't tell them in May I'm planning to do it next year. To replace the heating plant I'd need to have it setting out in 2025 and it marches down as we get to 25 and then it gets done.

Investing in Energy Efficiency

ENBRIDGE

There are many reasons for investing in energy efficiency based on desired positive outcomes and benefits.

We talk about that triple bottom line - it's good for the environment, for cost and for people.

Reducing Operating Costs
which results in increases in profitability and property value – for residential buildings where rents are regulated or in lowering per sq ft cost for commercial buildings.

Greener New Builds
For new properties, energy efficiency and is considered in all aspects of the building's design.

Reducing Consumption
related to a reduction in energy consumption – both electricity and natural gas, in addition to reducing water use, and waste.

Meeting Sustainability Goals
Directly related to a desire to help the environment including reducing waste and carbon footprint.

Attracting Investors
or satisfying their desire / requests for optimal profitability by reducing costs, and for being a sustainable investment.

Available Incentives
Taking advantage of available incentives, which can have time limits, and which help drive payback periods down.

Attracting Tenants
particularly commercial ones who require demonstrable energy efficiency or sustainability in spaces they lease.

Meeting benchmarking goals
The Global Real Estate Sustainability Benchmark (GRESB), ENERGY STAR® and other benchmarking scores are helpful in setting and meeting energy efficiency goals, and in attracting investors.

Ipsos

Energy Project Decisions

The business case is developed and led by an individual champion who puts together the required calculations – both consumption, and costs – engineering and/or technical analysis, or other items required for a decision. This can be done on their own, together with an internal team, or with the help of third-party consultants.

Typically someone in my position would be the champion of those [projects].

Even when working for large companies, most within a sustainability or energy management role describe their teams as small, and as such, have many competing internal interests and tasks of which energy conservation is one. As such, they sometimes don't have the bandwidth or resources to take on as many energy efficiency projects as they would like.

[…] there's just a lot of work to be done on many fronts. And so, our capacity, you know, we're not like other business units where they have teams of accountants and teams of operators and teams of leasing agents. We're small and we're mighty.

Pilot projects might be run where an energy efficiency initiative is tested in a limited number of buildings to gauge success, in terms of reduced consumption and costs but also in terms of tenant comfort, and operational items such as maintenance and failure.

[…] we'll have sort of a pilot project where we test out a new solution at a handful of buildings before we do roll it out to make sure it works for our buildings and it's efficient, and financially responsible, before we roll it out across our portfolio.

Energy Project Decisions cont'd

In terms of decision-makers, it depends by organization – it could be ownership or investor teams, asset managers, or other senior executives, while the stakeholders we spoke to directly are in charge of building the business case and bringing to the decision-makers. There are many considerations that go into each decision.

PAYBACK PERIOD

For Office, Retail and MURB, an ideal and acceptable period is around 5 years; although mention was made that there is increasingly greater tolerance for longer periods of about 8-9 years.

AVAILABLE INCENTIVES

Most characterize Enbridge Gas programs as helping the business case in terms of reducing the payback period and it can be a deciding factor as to whether or not the project will go ahead, or in moving the timing of a project forward.

ONGOING MAINTENANCE

Maintenance of the new equipment and how easy or difficult it is anticipated to be, and also the ability to easily find replacement parts. Equipment that is harder to source and maintain is less appealing.

TENANT COMFORT

Tenant comfort and well-being is of primary importance. Any renovation or other work being done needs to minimize disruption. Not all energy efficiency projects result in increased tenant comfort.

ANTICIPATED SAVINGS

Anticipated reduction in consumption and savings can be substantial and this can make the business case compelling, particularly if there have been other successful energy efficiency projects.

Natural Gas vs Electricity Projects

Electricity projects can be seen as more of a priority because of the **higher cost of the commodity itself** compared to natural gas, a more stable natural gas price over time, and because **overall electricity bill costs** are (much) higher.

However, for properties that have natural gas / boiler heating systems, natural gas conservation can be of equal, or more of a priority.

There was a perception by some of more **available incentives and a higher level of engagement** with electricity utilities. In some instances, natural gas incentives can feel immaterial relative to the cost of capital planning budgets.

Natural gas projects are also considered **more capital intensive than electricity ones** – for example, replacing a boiler is considered a costly endeavour, especially relative to the capital required for some electricity projects.

Because electricity in Ontario is considered a clean supply, **reducing natural gas consumption in order to help the environment by reducing carbon footprint and greenhouse gas emissions** is an important consideration.

As such, this can be a primary motivator from a sustainability standpoint.

Labeling Credentials

Awareness of Pan Canadian Framework or Net Zero Ready by 2030 are mixed to low and most members do not aspire to these formal types of broader conservation objectives; however many of the larger organizations have sustainability targets or goals in place.

Sustainability is typically driven, executed and measured internally, and there is usually a small team in place who oversees and implements this – either as their sole function, or as part of their broader energy management responsibilities.

Familiarity with the Pan Canadian Framework was low, and Net Zero was not considered feasible for existing buildings, because of the capital and energy intensity of such a pursuit – carbon offsets or not using natural gas at all were considered the only viable ways to achieve net zero on existing buildings. That said, carbon footprint and emissions reduction is a goal for many.

However, for new builds, Net Zero or as close to it as possible is a goal for developers and builders.

There were mixed views on labeling credentials such as LEED or BOMA Best. Overall there are worthwhile characteristics and elements of each of these, but whether or not the actual credentials are pursued varies.

Those who do find these important are driven by commercial clients who want to lease from a LEED Gold Building, while it is less applicable for residential tenants, who are more driven by availability and cost when looking for a place to rent. Mentions were made that LEED certification is not worth the cost, and that BOMA Best is mostly for commercial buildings.

Tools and Resources

Those who oversee energy conservation, sustainability and/or energy management generally employ a number of tools, resources and approaches to help them actively monitor and manage energy consumption, and they work with these in the implementation of any energy efficiency or capital projects.

BAS (Building Automation System) – these are not universal, but all have at least some buildings in their portfolios with BAS in place and these are crucial in operationalizing energy efficiency in these buildings, and in the collection of real-time data.

Operations Teams – stakeholders work closely with their internal Ops teams to execute energy efficiency projects and these are characterized as very effective and positive relationships. The Ops team were at the corporate level, or "boots on the ground" at the building level. The delineation between functions and roles of operations vs energy management varied by company.

Energy Management Information Systems (EMIS) – these are used by the customer stakeholders we spoke to, and this is considered a crucial component of their ability to monitor, track and manage energy consumption. Further, this is an invaluable tool in measuring the success of their energy efficiency projects. The companies either have internal systems or are using third-party software to facilitate this.

Benchmarking

Mentions were made of GRESB, the Global Real Estate Sustainability Benchmark, which is considered the gold standard benchmark in the real estate sector – having a good GRESB score is a signal to investors and the sector generally that a company is meeting or exceeding sustainability benchmarks. This is measured at the corporate / company and not individual building level, and this is a global program, which is important as companies have international investors.

[Benchmarks are] a motivator. The commercial real estate industry is super competitive with regards to benchmarks of all sorts, not just sustainability. So, it's a very easy business case when I go to my bosses and say, "look, we're underperforming against the market in this area".

ENERGY STAR® was also mentioned unaided as a benchmark via a scoring system that is useful in helping to understand energy consumption, and these companies actively work towards improving their scores. There was mention of ENERGY STAR® certification for buildings which companies might achieve or aspire to, particularly for those buildings who need LEED certification.

But what became important, or was a requirement, to get LEED, you had to have a minimum Energy Star score of 69. And then when LEED came along, and large creditworthy tenants with big covenants like banks, and insurance companies started saying […] "Is your building LEED certified?" Because if it wasn't, they would go find a building that was. And so, all of a sudden it changed the dynamic. Now, it wasn't what's the payback on 40 cents a square foot worth of savings, it's, what do we have to do to get Energy Star 69?

Benchmarking cont'd

Energy and Water Reporting and Benchmarking (EWRB) was mostly viewed as a positive initiative in principle. Associations felt that it would likely be the smaller companies who may have challenges or barriers in putting together the necessary information. Larger companies are already collecting the data that would be needed to participate in EWRB.

Mention was made that at a macro level, benchmarking is difficult because at the utility accounts are billed by account and not customer, and one customer might have multiple accounts – so practically speaking, it can be difficult to get the right information.

Those who had already participated in this initiative were not close to their scores and had not given it much thought after putting their data and information in – so although they were agreeable to participating, this does currently act as a motivator to pursue energy efficiency opportunities.

[…] Enbridge is a big machine. So I recognize it's not as easy for them to change. And there's big structural issues, like you have your whole database built on this idea that of your invoicing accounts, and you don't have this concept of a building in your database. It's not straightforward to all of a sudden come up with that.

Suggestions were made that the pre-existing "Green Button" could be used to assist the gathering of data and information needed for EWRB, as this is a turnkey solution that is already being used in other jurisdictions.

These stakeholders felt that this might help companies who are struggling to participate in EWRB due to the reporting requirements, as well as to help with consistency issues with reporting requirements across all the various utilities.

I understand Green Button is a protocol that has already been developed. So rather than having Enbridge or Toronto Hydro develop their own, just adopt the existing standard. And given it's been adopted in other jurisdictions, hopefully that would be a national, international standard.

Amendment 15

ENBRIDGE

The contractors will say, "we can work with whatever technology". The manufacturers who are bringing the product into the country might say, and some of them have said, "we don't have enough of the product that this requires the technology advancement required that we will make it very difficult to supply in the right numbers the kinds of boilers that we'll be legally permitted to sell".

This would be almost impossible for the natural gas burning appliances in Canada to create a database and track it. Not impossible. But I'm not sure the money would be well spent. But I think understanding the deadline fully and how you move people to make those changes. I'm not fully cognizant if it's new or retrofit, this requirement.

Awareness of Amendment 15 and the upcoming changes to Natural Resources Canada (NRCAN) requirements was low. Most said that they, or their members or clients, would be affected by these changes.

Reactions were typically matter-of-fact in that all strive to be compliant with any changes in regulations. Most recent / new boilers that have been installed are close to, or at, 90% efficiency. Associations typically provide this type of information to their members, and HVAC vendors would in turn advise their customers of this change; manufacturers have raised concerns about supply.

Questions were raised about whether this applied to existing boilers or if this applied only to new installations.

In terms of perceived challenges, questions arose about the enforceability of this regulation given the number of boilers across the country that would be affected. Similar types of changes have resulted in a surge of "last minute" replacements, such that there may be a shortage of available equipment or installers as the deadlines approach.

Ipsos

Amendment 15 cont'd

[Use] a multi-pronged approach with different tactics. Definitely a webinar is one of them that we will be using, just like we did when regulations with respect to chillers changed. So, same thing. We will do that same thing for this regulation. And then, there also needs to be social media, awareness-building through social media, as well as any other medium. For example, we use Canadian Property Magazine, Canadian Property Management Magazine, we use our own internal e-notices, and things like that. So, basically we will leverage all channels to get the word out, and Enbridge should do the same.

In terms of support that Enbridge Gas could provide, various thoughts and ideas were provided, including:

- A **webinar** on the upcoming changes and how they could be implemented directly from Enbridge Gas
- **Partnership with associations** to disseminate information to members – the associations we spoke to were open to this idea and said that this was the type of information they typically provide
- **Communication from Enbridge Gas or associations** on the upcoming changes, in the form of emails, newsletters or contact from account reps
- **Incentives** for those who might have difficulty affording the cost to replace a boiler – in particular, smaller players
- **Project management support** in providing expertise and knowledge on how to implement these changes, for those who might not have this on their own or internally.
- A **multi-pronged approach** integrating some or all of the above

Technology

Opinions on likelihood to adopt new technology and willingness to be innovative varied by stakeholder.

Business Partner (Technology Provider)	Direct to Customer	Associations (General Sector)	HVAC Industry
Their core business is actually built around adopting or developing new technologies, and the value / benefit these bring in terms of driving energy efficiency for their clients and customers. They would like to see more of these adopted generally, as well as more incentivization by Enbridge Gas for these technologies.	Most customers said that they are interested in new technologies that might help them reach their energy efficiency or sustainability goals and targets and demonstrate leadership to their tenants. However, there needs to be a strong demonstrated business case for these to be implemented.	The overall perception is that the industry in general are not early adopters or pioneers except for a few very large players. There needs to be a strong case to enhance services for their tenants, and / or a substantial environmental impact in terms of reducing emissions. For many, the likelihood to adopt is heavily dependent on payback.	Contractors and manufacturers do not consider themselves to be in the energy efficiency business but in the furnace / HVAC business. As such, they are not motivated to adopt new technologies and further, there are questions and concerns about finding the right delivery channel for these.

Technology cont'd

Heat Pumps

Awareness of heat pumps was high and most felt that these are a good additional or alternative heat source to natural gas and this is one being actively used or investigated. Of the various technologies tested, this was considered the most feasible within existing properties as opposed to feeling limited to new builds.

Definitely, I think heat pumps are super energy efficient, and a great alternative for residential. I think for commercial as well. I think around the heat pump, the biggest thing is maintenance. So it just comes down to training and awareness. Historically, [our company] used to manage very simple sites, but with a heat pump it could get complicated. So definitely focus and some money incentives around awareness would be a great thing.

I'd say [interest] is high. We have a lot of older building systems, and I know there are conversions over to heat pumps, which will reduce the overall energy of your building. And a lot of it is actually offsetting your gas with more electricity usage, because it takes electricity to run the heat pumps. So I think the overall energy is decreasing and the energy being consumed is more environmentally friendly. For new build, generally we'll use heat pump systems, so we are using one that, from a retrofit standpoint, I think we're a bit of a ways away from that for now because of the amount of capital involved.

Geothermal

Awareness of geothermal was high and there was some limited interest in it. There were barriers associated with it, namely the high cost / long payback period, and the need for physical space – which would not work in dense downtown areas – and a limited ability to install such technology retroactively. One respondent had tried geothermal in a building but there were technical issues, so their perception of this technology was negatively affected. While it is something that might be considered for future builds it is not generally considered a viable or appealing option for existing properties.

Yeah, and where they dug those wells, I guess, was not engineered correctly and we did not get the desired outcome, so we ended up having to put in a standard heating system instead. It was not a good experience for us […] [Future interest] depends on the cost involved, and if we're able to reduce our operating expense significantly over the term of the asset – like what are our cash flows going to be – it's definitely something of interest to us. I don't' know how cheaply that can be done.

We had one building with geothermal and it wasn't engineered correctly so we had to decommission it. […] where they dug those wells, I guess, was not engineered correctly and we did not get the desired outcome, so we ended up having to put in a standard heating system instead. It was not a good experience for us.

Technology cont'd

ENBRIDGE

Solar Walls

Awareness of solar walls was mixed and generally clarification of the technology was required / provided. While this idea was somewhat appealing, there would be barriers to installation such as lack of an available surface and the potential for reflection into other buildings. There were also concerns about solar energy generally in the waste they create once the equipment has reached end-of-life and if/how they would be disposed of.

I've never worked directly with any of these technologies, so I'm not sure from an economic perspective how feasible it is. But from its potential to disrupt tenants, and any sort of day to day business, our experience has been, if it's that expensive, it requires a lot more planning, longer term planning, and if Enbridge is interested in promoting new technologies, again, there needs to be sufficient financial incentives of some sort to be able to even for us to consider it.

We're actually submitting for a solar wall in our 2021 budget, as a pilot. So we are aware of it and we're looking to get at least one project done next year […] It is a significant capital investment, so how quickly we could deploy that is really going to depend on what our investors' interest is, but for the one project we are looking at doing, we got quoted for one and it was going to save us kilowatt hours in Quebec […] that's going to reduce our natural gas consumption so that we meet our required return on the investment, but also have a bigger environmental impact.

VRF

Most were unaware of VRF (variable refrigerant flow). Initial reactions were mixed – some felt that this could resolve issues with certain indoor hot or cold spots and that it would be easier to install than entirely new systems, and so that idea was appealing. However, the use of refrigerant itself, and whether or not it would potentially be toxic, was cause for concern in terms of tenant health and safety.

Yeah, because it's a lot easier to fill that infrastructure, you know, when you've got the building coming up from the ground versus ripping out walls and existing plumbing, especially in a building that has people living in it. So, looking at energy efficiency measures in the design phase of a new project would definitely, would be very beneficial as to making sure, like I said before, you know, a new build being the most efficient design we can implement into a design.

[…] the flow is more around the varying degree of coldness or the temperature depending upon the outside temperature and what's required outside, depending on occupancy and other things. So I think variable represents… I think it's a good, simple measurement that can be applied even in existing sites. New sites, definitely, but even existing sites can retrofit and apply a lot of savings.

Ipsos

Enbridge Gas Programs

Many stakeholders are keenly aware that natural gas incentives are available, although awareness of all the different one / types was mixed. **Most customer stakeholders stated that these are helpful or crucial in moving energy efficiency programs forward, and so they try to take advantage of incentives as much as possible**. There was also some uncertainty as to how much of an incentive they would potentially receive for a project and this was an area where they would appreciate greater certainty.

Opinions on the level of difficulty and/or willingness to fill out the necessary paperwork **– for small and medium sized landlords/ managers in particular, associations felt they may lack the time, resources and motivation to do so.** That said, even those who work for large players stated that since their teams are relatively small, they may not have the time and resources necessary to fully investigate and apply for all available options.

When asked about other services Enbridge Gas provides, **interest was high in situations where this was a perceived gap for the company, or for associations / business partners who represent these members and clients**. However, many of the larger players already undertake these activities on their own or through vendors, and so for these stakeholders, interest was more limited. Generally there was limited willingness from customers to co-pay for services such as audits.

If the next level of low-hanging fruit is what I call the small and the medium-sized players, you need to be able to provide the resources to those players to help fill out the paperwork and go through the requirements and understanding of the requirements that need to be there. That's been a longstanding issue with our industry and the utility companies for as long as I've been around it, to be honest with you.

And I need some hand holding from Enbridge if I'm really going to prove that success […] I need help, I need boots on the ground.

[…] there's different levels of auditing and everything like that. So, you know, there's walkthrough audits that don't take much resources, but we want to have good opportunities, you know, investigate a little more than that. So, I think we'd definitely be willing to pay a portion to have that audit completed. And it can be, depending on what measures it drives, you know, it could be not a large commitment.

Enbridge Gas Programs cont'd

Interest in a free online energy audit tool was mixed and overall, there was a muted response to this idea. Some thought this would be especially helpful and appealing in understanding what the potential incentives would be on a project. **In order to ensure use/uptick, the tool would need to be very simple, easy-to-use and turnkey.**

Others felt that this is a service they are already receiving through third parties, or something that they are already calculating through other means and so this was less appealing. The word "audit" can also have a negative connotation and so a word such as "assessment" might be better perceived.

Overall, for Office, Retail and MURB, **one of the most important elements in driving likelihood to participate in Enbridge Gas programs was about the relationship – even among those with an advisor, they would be open to hearing proactively from them and touching base periodically** about available programs and opportunities. For those who do not have a contact, this would be an area of great interest in terms of establishing one.

The ongoing stability of the programs and incentives, given the long periods of planning required for a larger item such as a boiler, would also be helpful in continuing to support stakeholders in making a business case.

[W]ith respect to demand management I think that's an untapped market for utility providers […] those people [mid-tier group] want someone to come to them with a turnkey solution like, "hey, we noticed your building is so many square feet, you're using so much gas, like, is something going on in there? Can we have a look and give you a quick audit with turnkey solutions with real savings so this is revenue neutral?

If it's something, if it's a new program they're running or a change of some sort to an existing program that, you know, we may not either know about or know exactly how it applies to us, having that explained to us I feel, because of our large portfolio, we would be able to then potentially find opportunities where that can benefit us.

Especially if they have information and are able to tell us, hey, this would be a… here's the opportunity, here's what we're willing to offer you, would you be interested? You're bound to get a couple projects like that, for sure.

But having stable incentive programs is definitely helpful, especially because, for instance, we do so many boilers and we're doing that, it's very beneficial to know even a few years out that we have this resource available to us that can help drive the decision of implementing a measure.

Enbridge Gas Programs cont'd

When finding vendors for various projects, **most have a roster of trusted ones who they use regularly, or their operations staff have trusted vendors** and the stakeholders we interviewed might not be directly involved in choosing a vendor. This is to avoid any unforeseen complications with a project down the road. Most go to tender on any projects, and there is openness by some to use vendors who they don't know or use regularly.

In terms of having Enbridge Gas put together a trade ally network of vendors, **most viewed this positively based on an assumption that Enbridge Gas would vet these contacts in some way** – be it in terms of tenure, proven track record or other metrics.

Conversely, business partners would welcome the opportunity to be "endorsed" by Enbridge Gas via being included in this network. One notable exception was in a network for residential vendors, in that in the past, Enbridge Gas was a competitor in terms of being an HVAC provider and in providing recommendations, and so **reassurances of the independence of this network would be needed in order to mitigate these concerns**. This also felt like a duplication in terms of the industry association's role / function – the association itself has rigourous standards and there was concern that Enbridge Gas may not apply the same high level of standards in terms of endorsements.

But we don't have a lot of sight lines to a new manufacturer or something new out there and I think that would be a great resource where we could say, hey look I found this new cool product, what do you think? And then you do the investigation. And then you can tell your mechanical consultant, maybe we should consider these. They might not be aware as well.

Absolutely and we'd want to be in there as one of those people who could be looked up. I think that would be valuable. I just think that to make a database like that useful there has to be careful consideration to vetting on Enbridge's side. A database like that is only as useful as basically the entries in it have been screened. Without favouritism or at least not overtly. It's useful but it would require some thought about how to manage the reliability and quality of the data within it.

Barriers

There were many potential barriers identified in terms of energy efficiency generally, or in participating in Enbridge Gas programs. In general, the greatest barriers are the ones related to cost.

- A lack of awareness of available programs and incentives
- A feeling that the program might not be applicable to them, particularly for smaller players
- A lack of understanding of what the benefit would be in participating
- A lack of desire or available funds to replace equipment or conduct an energy audit
- A perception that the available incentive was not material enough to make applying worthwhile
- The lower and more stable cost of natural gas in Ontario relative to electricity, resulting in a greater priority on electricity conservation projects
- The higher cost of more energy efficient equipment due to more complicated engineering, compared to less efficient equipment
- A lack of understanding and mistrust of why Enbridge Gas would offer incentive programs and encouraging customers to use less of their product
- A gap in terms of specific training certifications, programs, and initiatives that could enhance energy literacy and overcome the knowledge barriers.
- A lack of knowledge within trades on how to install more energy efficient equipment; or a desire to recommend the lowest upfront capital cost option to their customers

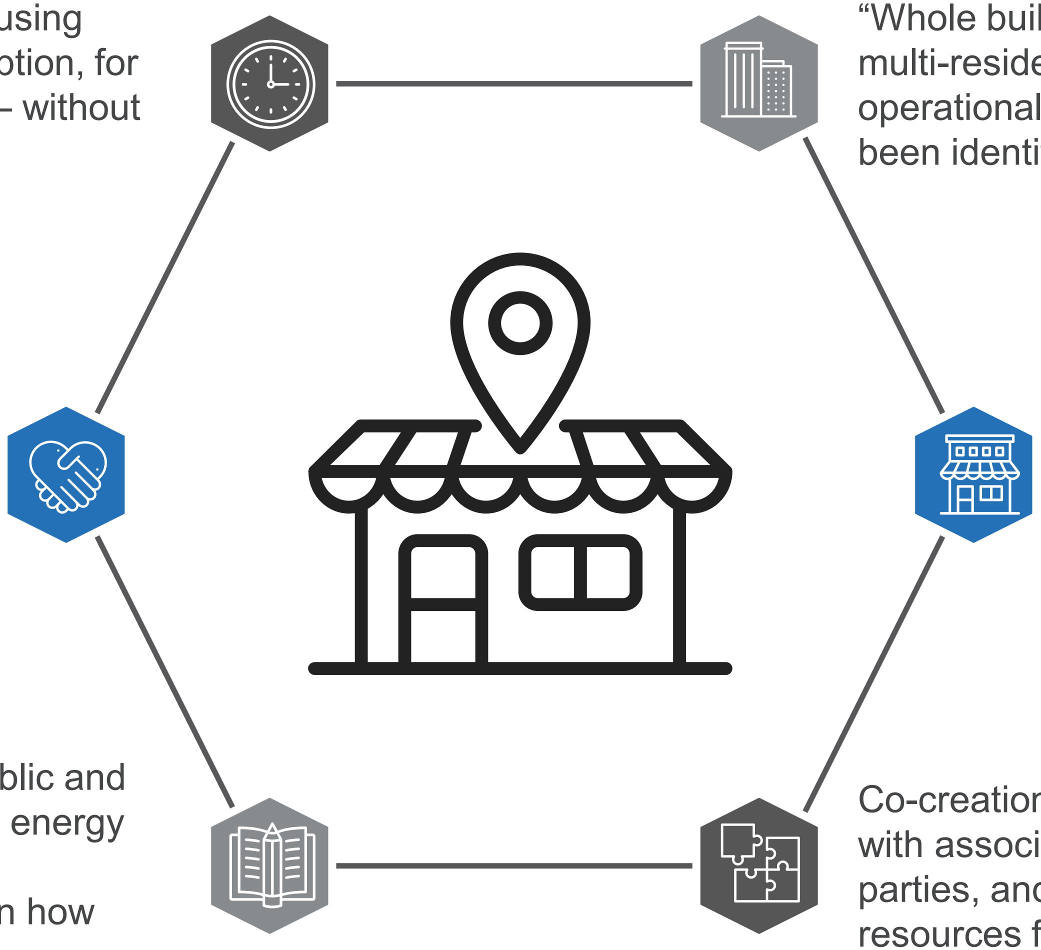
Enablers

ENBRIDGE

Making real-time hourly interval data readily available, rather than using monthly bills to track consumption, for large commercial customers – without any administrative reporting requirements attached to it.

"Whole building envelope" programs for multi-residential buildings where operational efficiencies have already been identified.

For customers, having a dedicated natural gas management resource for their file. Supporting HVAC vendors by creating a "concierge service" in which Enbridge Gas could help commercial contractors write proposals for their customers.



Programs designed for smaller-scale property owners who might not have the capital for capital-intensive retrofits – providing resources, expertise and government incentives specifically for them.

Providing education to the public and training for HVAC vendors on energy efficiency; making vendors "ambassadors", particularly on how programs can help.

Co-creation of programs in conjunction with associations and other interested parties, and/or funding of embedded resources for these entities.

Ipsos

Retrocommissioning

Opinions were polarized on retrocommissioning and its value in enabling energy efficiency.

Some see this as a very positive way to increase energy efficiency and as a possible way forward, with others who are already undertaking similar measures in terms of understanding how to operationalize these measures, and implementing them – even if it is not called "retrocommissioning" per se.

To me, [retrocommissioning] is the future […] These companies have invested hundreds of millions of billions of shareholder capital in buying these buildings. It's in their best interest to want to keep these buildings going for a longer time, so it's absolutely on their mindset. They're looking for, how is government and how are the utility companies going to work with the industry to recommission buildings?

However, there are those who believe that there are new technologies or ways of looking at operations and maintenance that are much more advanced than retrocommissioning, by using real-time data from a building's automation system.

Mention was made of "constant commissioning" which means that there are efforts made year-round to identify operational opportunities for energy efficiency, based on a similar premise of using Building Automation System (BAS) and algorithms or Artificial intelligence (AI).

Retrocommissioning is so 2008. It's all about real time BAS data, and BAS being the building automation system, the control system for the building, which traditionally has been collected on the BAS computer in the building. And then you could look at trends for some of this data, except in practice, very, very painful to look at these trends, pull them up […] However, if we're flowing it into the cloud, in real time, cloud has infinite space and infinite computing power […] So now, you're using analytics first to figure out the best way to operate the building, and to identify areas where the operation could be approved.

Collaboration

[At our association] we have our ongoing efforts to promote better building performance and operational excellence. That's in our DNA. Everything that we do ultimately leads to that direction. But specific initiatives, we have education programs, we have a friendly corporate challenge […] Basically, it's a recognition program those buildings that are doing exceptionally well in terms of achieving energy efficiency, and waste management, and water management, and emission reduction. So, by an organization like Enbridge partnering with us on initiatives like that, which they are, by the way, is another vehicle to promote energy efficiency, and also is a way to recognize those leaders who are doing that.

Interest by associations in collaborating with Enbridge Gas is high. They feel there is a role for associations in:

- Identifying who association members are for Enbridge Gas
- Building awareness of existing programs
- Consulting with them in partnership with Enbridge Gas and other associations (for example, municipalities) in hearing what relevant programming would be
- Partnering on existing or new initiatives that promote energy efficiency
- Recognizing existing industry leaders

Small Businesses

In terms of energy, small and medium sized businesses are **very much focused on costs and will turn to associations for advice and support on how to lower their bills.** They do not typically have tools, resources or internal staff to help them in understanding their usage and how to lower consumption on their own. While electricity has been the primary energy cost concern, the cost of natural gas becomes more of a concern in winter.

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 multi-pronged, 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".

I'd say cost is very much the number one. Our members really are very focused on their bottom line, so that's the biggest one. It's not to say those other things aren't there. There are environmental considerations, or personal. Our members believe in things like energy efficiency and environmental friendliness for personal reasons, but ultimately on the business side, it is very motivated on the cost aspect. And if the program and the thing they're doing is helpful for the environment, or climate change, or whatever else, that's a very positive byproduct. But the first thing they're going to be looking at is, is this helping my bottom line? Am I saving money?

As you know, giving those small businesses a line of sight to what's available is extremely important. They're too busy running their businesses as opposed to trying to search for what kind of programs are out there they can tap into - whether an energy conservation program, training support program, export program. They really have a hard time understanding because there is so much information being pushed at them. We thought the Internet would solve our information problems. It has created an information overload problem for small businesses. The [SME] president is actually doing…I use the number 17…it could be 21 things on a daily basis. They don't have a lot of supports and bandwidth just to keep the lights on. It's extremely important that whatever we do in the area of SME program supports, we really provide a simple way to help the companies understand and navigate to the program.

Small Businesses cont'd

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.

I have asked companies anecdotally over the years, in addition to money, what could I do for you that would really help you? invariably, the response I get is, "Do it for me." They don't have the bandwidth to do it in most instances. So when we design a program, I keep that in mind.

[…] a program that can be automatically applied or is just ticking a box once you've met eligibility criteria, and then you set it and forget it, those are the ideal programs. The ones that don't require too much paperwork, the ones that don't require too much extra active attention, or things to do from the business owner, are always the ones that are going to play best.

When we ran the other programs I didn't get that sense. It's more, is someone trying to upset me? Or is someone trying to help me save money on bills? That's the balance people have to really try to get across in their information. Trusted partner is extremely important. When I'm going out, the Chamber is going out we have no skin in the game. Our role is really to help our members with supports that are out there. And they understand that. I'm not there to sell them something. In other programs we've run where there's regulatory requirements and there are people…the disability legislation…they're telling members they need to have this and that to be in line with disability legislation. In that case it was our job to dispel what people were telling them they needed to spend money on. That's the kind of relationship. Extremely important.

UNIVERSITY, SCHOOL BOARD AND HOSPITAL REPRESENTATIVES

Energy Efficiency

Size of university, school board and hospital stakeholders matters in terms of the level of effort and having specialist staff dedicated to energy consumption monitoring and energy efficiency opportunities: larger institutions are more likely to have dedicated energy managers vs. smaller institutions where the role falls within buildings and facilities departments managers. Yet even within large institutions, building awareness of and buy-in to energy efficiency can be a challenge with stakeholders admitting to not coming across projects till after the fact.

Sharing of best practices on energy issues is common through organizations such as Ontario Association Of School Business Officials (OASBO) and Ontario Association of Physical Plant Administrators (OAPPA).

Some of them have an energy manager, a dedicated energy manager that works with the Facilities Department. That's the ideal scenario, because then the energy manager is advising the Facilities Department on every project that they're considering, and is able to have some input on potential for energy saving. […] Typically smaller school boards just don't have the staff, so they don't have a dedicated energy manager, and then energy conservation drops off for the most part.

As with the other key stakeholders, capital planning can be annual or multi-year. School boards have the most predictable cycle: planning tends to begin in late spring and summer; approvals are granted in the fall once school budgets are approved; tenders are issued and approved between winter and spring; implementation take place in the summer while school is closed. The process was less prescriptive for municipalities and universities who reported both annual and multi-year capital plans and 'rolling lists' of upcoming projects.

Natural gas capital replacement projects tended to be considered at end of life. This can be brought forward where maintenance costs are unsustainable, as part of a major building overhaul project (e.g. AODA compliance projects) or availability of incentives.

You try and hit as many as you can. Sometimes it's only an energy efficiency job but most times it also addresses some deferred maintenance, and some other things, at the same time. […] You have to do an accessibility project, for example, because it is funding directly tied to accessibility. But at the same time, if you can improve the energy efficiency of the building by putting new doors, as opposed to the leaky old doors that were there, then you are going to get a small energy efficiency benefit of it.

Investing in Energy Efficiency

Saving on energy cost remains a key motivator but increasingly environmental sustainability is part of the conversation.

We have a low carbon action plan where we're looking to be zero carbon in 2050. […] Energy costs me $50 million a year, which is an ongoing operating cost. […] so there's a spend perspective. From a business moving forward perspective, […] our carbon tax will be crazy. And it's the right thing to do.

Improving the bottom line

The longer-term savings from more efficient options are a 'no-brainer' and for bigger energy users, prospective carbon tax is a big incentive to manage energy use. The challenge becomes in finding funding to bridge the gap between more vs. less efficient options.

It is the "right thing to do" & meeting sustainability goals

Intuitions, especially in the higher education sector, are increasingly environmentally conscious. They recognize the significant positive impact they can have as large consumers of energy.

Sustainability goals, in the form of net-zero, are more common in the higher education sector. Whereas for school boards and municipalities, energy intensity targets are more common. Across the board, targets tend to be at an aggregate level as opposed to specific to natural gas consumption.

Available incentives

These stakeholders take full advantage of any incentives that are available and applicable to them. In addition to Enbridge Gas incentives, participants look to IESO incentives and provincial (e.g. GHGs specific funding to higher ed. sector) and federal funding

Incentives can have the dual role of making the business case for a more efficient option/new technology or accelerate replacement decisions to take advantage of an incentive program coming to an end.

Educating the next generation

Measures implemented can be a source for energy learning – e.g., in one school board, students are shown real time information of energy consumption. – to *"create and train the leaders of the future and get them to think differently and behave differently"*.

Energy Project Decisions

These stakeholders are integral to the decision-making process, but they are not the sole decision-makers: typically, final approval is provided at senior leadership level (e.g., Council, Assistant Vice Principals) with involvement of teams where the project is being initiated (e.g. superintendents in school boards).

COMPETING PRIORITIES

Limited funding is a key challenge facing these stakeholders as energy efficiency is one of many competing priorities. Still, energy efficiency is seen as a medium to high priority with some reporting that energy efficiency is built into the scope of new buildings. Having access to staff to review projects from an energy efficiency lens is critical.

MAKING THE BUSINESS CASE

The case of energy efficiency measures balance capital costs (equipment & installation) vs. anticipated savings vs. incentives. A payback period of 3-5 years is acceptable but there is tolerance for close to 20 years due to the longevity of these sectors. With limited funds and buy-in, a significantly lower upfront outlay can be considerably more attractive than future savings coupled with an incentive that covers a small percentage of the initial capital investment.

OTHER LIMITING FACTORS

Beyond costs, decisions must account for health and safety of staff and students, what is feasible within ageing infrastructure and ongoing operating and maintenance of new equipment and technologies.

PROCUREMENT PROCESS

It is standard practice for institutions to procure projects through a competitive procurement processes as opposed to relying on pre-approved vendors. This in part explains the lack of consistencies in technologies that may be implemented over time.

Benchmarking & Tools for Monitoring

All of these stakeholders report building energy use to the Ministry of Energy. This is a fairly simple task in the case of school boards given the existence of the Utility Consumption Database. For universities, this is reported at a campus level due to lack of metering available at building level (and there's no payback to incentivize their installation) and challenges of having very high energy use buildings (e.g. labs) in the context of the MOE methodology.

The act of reporting and benchmarking appears to have limited impact in driving more energy efficiency projects. One participant admitted to feeling motivated and *"proud"* with his institution's ranking, whereas in most cases stakeholders reported they would be actively monitoring and improving energy intensity scores even in the absence of MOE reporting.

Ongoing monitoring of energy use tends to be done internally and via the use of Energy Management Information Systems. External consultants are more relevant in relation to advising on demand-side management programs (especially in the electricity sector), energy audits (the type done depends on project or incentive program), helping with designing new projects and verification of savings.

The Ministry of Education started a very large utility database 10 years ago, and it has every electricity and natural gas account for every school in Ontario, and it's updated monthly. Any school board has access to their own portfolio of schools, and can look at the numbers at any time. […] The annual report that the Ministry of Energy requires the school boards to complete is all done based on the data from that database. There's not a lot of work for the school boards to do to report on an annual basis.

There's a bit of an internal competition among campuses, and there's a bit of a follower-the-leader sort of thing. And you kind of question, you know, why is University of Windsor the highest energy intensive university in the province of Ontario? You know, why? You know, I don't understand that, so just makes you ask some questions, and that too, so.

Retrocommissioning & Energy Literacy

University, school board and hospital stakeholders are familiar and receptive to retrocommissioning. It is a relatively low-cost way to realise savings and one of the various tools institutions turn to.

Where there was push back (in 1 case), this was based on belief that good maintenance package precludes the need to retrocommission.

It can be effective, yes. Because, you know, buildings and systems generally do need to be checked and recalibrated, and brought back into compliance. And retrocommissioning is a way of doing that.

These stakeholders are receptive to any market actor to provide information and preference is for technical details than a sales pitch. Engineering firms tend to be relied on more so than other market actors due to their heavier involvement in projects. Presentations from vendors are typical in the energy committees of sector associations they are part of.

Improving energy literacy internally within organisations is recognised by some as important. This responsibility tends to fall on participants themselves as opposed to using external programs and certifications.

Because I do not have the time to go out and learn about everything, and I've got people who are selling everything. And if you want to sell to me, you need to come in and train me on what you think I should buy. So, all my major vendors have to come to my office, and sit in front of me and tell me, whether or not I'm paying their bills, whether or not they're getting along with my people, and what's new in their world.

Amendment 15 & Technologies

I doubt they have something in there that's making people go back and change existing infrastructure. […] I totally support it. It's the same thing as having efficiency standards for vehicles. There's no reason right now that if you have a hot water system, you shouldn't be using a condensing boiler with high efficiency.

To make the school eligible, they would have to replace all of the perimeter heating rads around the school. So that the project wouldn't just be a matter of replacing the boiler, it would be a much larger project. I'm not saying it can't be done, but it would be a pretty major project, I imagine, and costly project, to do something like that.

Engage with your client base, have the Enbridge account managers reach out to the various contacts and let them know these thi…

Awareness of Amendment 15 and the upcoming changes to NRCAN requirements is low.

These stakeholders expect this Amendment to be phased-in as old boilers are replaced. This led to general acceptance of it and few challenges are identified other than funding.

Information on this change could be provided either though the Enbridge Gas account manager or by presenting to the energy committees of associations.

There is good awareness and receptivity to technologies designed to integrate more fuel sources for space or water heating. In addition to those discussed in subsequent slides, the stakeholders in this sector are considering:

- whole building envelope designs
- biomass, geo-exchange and solar thermal

Technologies cont'd

Heat Pumps

Good awareness but their application is limited as efficiency drops significantly in winter necessitating a supplementary heating source.

One of the concerns is, in Ontario, you're going to have, even in Southern Ontario, you're going to have cold weather in the winter, and there's very little heat that you can extract from the air, so you have to have some kind of supplementary heating system.

Geothermal

This is a viable option for these stakeholders and ambitious geothermal fields are being installed. There is a high level of familiarity too given incentives were first introduced in the 1980s.

Because ground source heat pumps work with geothermal fields, and we're putting in one of the largest geothermal fields in an urban environment in North America.

Solar Walls

Potentially effective solution but has been implemented scarcely due to lack of available funding. Building aesthetics is also brought up a potential issue.

Those exist on university campuses. I know York has one. I think the only difficulty with implementing those, they are good, they're efficient, they're a good technology. It's how you incorporate them into the architectural aesthetic.

VRF

Do not foresee gaining traction due to installation complexities for older buildings. The risk of refrigerant leak in classrooms also makes this an unattractive proposition.

I can't honestly see a school board installing a VRF system, because instead of circulating water around the building, they're circulating refrigerant. […] And I think most school boards would look at that and say, "I wouldn't take this risk of a refrigerant leak in a classroom."

Enbridge Gas Programs

Awareness and satisfaction with Enbridge Gas programs is generally high among these stakeholders. Many indeed contrast the "straightforward" Enbridge Gas programs to those offered in the electricity sector and appreciate access to knowledgeable and responsive Enbridge Gas staff. Top-of-mind negative feedback is few and far in between other than more relationship building with customers.

These stakeholders place high value on all the service benefits Enbridge Gas strives to provide though stakeholder experiences of accessing these benefits are mixed:

Opportunity identification – some report experiences of where this has happened whereas others tend to rely on their own monitoring or work with other consultants for this

Savings and incentive estimates – there is a minority view that these are not as readily available as in the past

Access to audits – have been accessed and appreciated

RunSmart – awareness and experience of this is lower

Connections to trade professionals – little direct experience of this but open to being provided with connections

Financial incentives – as noted above, very positive feedback on this

I think they do a great job on their incentive programs, and I think also in their customer service. I think they are already out there doing a lot for their customers, and really understand the need to have the energy service consultants out there servicing the different sectors. Certainly give them full credit for that. The only thing I would suggest is to keep trying to have those face-to-face conversations.

I like the interaction between the account manager and the knowledge of the program. I also like the customer service aspect; I mean they're available when you need them. […] my understanding now is the account managers have to do all the engineering as well, and that's where I think the frustration lies, where there's always a two or three-month delay in getting the feedback

Enbridge Gas Programs cont'd & Collaboration

SITE ASSESSMENTS

While there is interest in this, the key will be demonstrating the value of the Enbridge Gas offer above what is being offered right now by way of audits and assessments.

How different would that be an energy audit or a RunSmart? If we were to need that, we would probably go direct to something that has an incentive, and having something more formal and more comprehensive, like the engineering audit. […] 95 percent of the time, they're the ones that are probably going to design what we want as a capital project in terms of the recommendations.

EMBEDDED ENERGY MANAGER

Can be a great opportunity for smaller institutions that lack dedicated staff. The proposed model is familiar due to similarities with the IESO program. Familiarity leads to receptivity but also questions as to how it will link up to the IESO offer.

We are in that kind of arrangement with IESO. I don't know how this will be different, in parallel [or] in addition. I don't know. But yes, it's a very good tool, approach, to promote energy efficiency, savings, and increase the resources, etcetera, etcetera.

COLLABORATION

These stakeholders are very open to collaboration with Enbridge Gas and there are no 'red tape' concerns given the positive view of Enbridge Gas programs. Collaboration is already happening with other organisations to access funding and with companies to implement new technologies.

There could be an opportunity [to collaborate]. We're always willing to listen and see what there is. If there's a way we could work together, we're open to that.

MUNICIPAL REPRESENTATIVES

Energy Efficiency

Energy efficiency measures are and have been a priority of importance for many municipalities for several years as it relates to municipally owned buildings. Most consider energy efficiency in their capital planning, which typically tends to span a few to several years – this is mostly within the context of capital improvements or new builds, although some do undertake projects for the sole purpose of increasing energy efficiency.

Depending on the size of the municipality, the number and type of municipally owned buildings and properties varied – anywhere from dozens to thousands – and they ranged from arenas, to corporate offices, to firehalls and ambulance stations, or mixed-use spaces such as community centres. Some also owned and operated their local transit service and consideration of these formed an important part of the municipality's energy efficiency plans and goals. Waste and water tended to be separate functions overseen by others.

Right now it is an annual basis with long-term planning. Obviously we do condition assessments of all our buildings, so we know what is in the queue for what needs to be replaced and when for a ten-year capital plan. In terms of budgeting periods we do it annually right now […] we also have the energy plan, where we plan some replacements and retrofits throughout that five-year plan too. It's a mix of both approaches I guess, currently.

Some municipalities have an asset management and planning team or resources who are responsible for forecasting life expectancy for equipment in municipally owned buildings, and they work collaboratively with the energy manager in order to build replacements/upgrades into capital plans and budgets. Ideally assets are pushed out as much as possible to end of life, and it is considered difficult or imprudent to replace equipment before then, unless there is a very attractive payback.

Conversely, assets do fail unexpectedly and, in those situations,, they need to be replaced as soon as possible, particularly in situations where the building affects or is used by the public. There is usually a contingency or emergency fund in place for these situations. Municipalities without asset management plans in place are currently working on building this capacity, or aspire to in future, recognizing its importance in their energy management goals.

So we have a fairly decent [asset] database. It's not perfect by any means, but we do have that. And I think it might have been two years ago now. I think the province mandated that municipalities and a whole bunch of other sectors, but focused on municipalities, start to develop an asset management plan. So we have this whole state of the infrastructure, SOTI [..].

Investing in Energy Efficiency

There are many reasons for investing in energy efficiency based on desired positive outcomes and benefits.

We have council direction right now through the Climate Emergency Action Plan to reduce our greenhouse gas emissions and become net zero by 2050. That's the main driver behind the GHG emission reductions.

Reducing or Offsetting Operating Costs
Energy is often one of the biggest costs for municipalities and energy conservation helps to reduce costs, or at least offset them given the rising costs of natural gas and electricity.

Greener New Builds
Considering energy efficiency in the design of a building and right from the start makes good economic and sustainability sense.

Reducing Consumption
Most municipalities have goals in place to reduce their energy consumption on municipally owned buildings.

Climate Change Mitigation
This is increasingly a priority as these are already being felt by municipalities today.

Emission Reduction Targets
Many municipalities have a net zero goal (by 2040, 2050) with a few municipality councils declaring **"climate emergency"** measures.

Community Energy Goals
Stakeholders are invested not only in municipally owned buildings (i.e., "corporate") but community energy as well – that is, educating and enabling residents and businesses on energy literacy, efficiency and conservation.

Municipal Benchmarking
This is less intense and less of a priority than in the private sector – nevertheless, understanding performance against other municipalities is of interest.

Attracting Residents and Businesses
This is particularly true for growing municipalities with a commuter based residential population; sustainability can be a selling point.

Energy Project Decisions

The individuals we spoke to would be the ones responsible for putting together both the longer-term capital plan and yearly budget and building the business cases for these – either by themselves, together with a team, or with the support of third-party consultants. Large projects require bigger and more complex teams in terms of planning and execution.

Simple energy saving projects are mostly started from our department or team. As said, if they are replacement of equipment projects, if they are new buildings, those will lead with other departments. But our role is to help them implement those projects with equipment, with technology, that will save energy in the long run.

The size of the energy management teams tends to correlate to the size of the municipality. Larger ones with more ambitious sustainability goals tended to have staff dedicated to conservation, where smaller ones might have energy efficient fall within a larger role, such as facilities manager.

There's sort of two umbrella divisions. […] One is Transportation and Environmental Services, which is the group that is in charge of water treatment, wastewater treatment, and waste management. And then the other group is Facilities, which looks pretty much at everything else that isn't process-related. So my role kind of feeds up into planning and performance management, and facility. So there's a small team of us who are looking at the near-term and 30-year plan for different building assets.

Capital plans and annual budgets are approved by municipal councils. Capital plans tend to be longer term and more overarching, or for bigger projects, while the annual budget is the tactical and financial plan for the year. A few municipalities also have a separate energy plan in place.

Yes we have a council, we also have an energy conservation committee which has council representation. And we also have two general public members in that committee so, it's a committee of council that assists with implementing and designing the energy plan. And then we have a senior leadership team corporately that would be a key decisionmaker as well. And they review all the capital projects that we put forward.

Energy Project Decisions cont'd

There are many considerations that go into decisions with an energy efficiency component:

PAYBACK PERIOD

Municipalities tend to have a higher tolerance for longer payback periods, although the strongest business cases are the ones with shorter paybacks.

AVAILABLE INCENTIVES

As in the private sector, available incentives can shorten the payback period of a project thus increasing its appeal. Municipalities take advantage of as many of these as possible within whatever knowledge they have of them.

NEW TECHNOLOGY

Municipalities are actively considering new available technologies in both retrofits / existing equipment, and in new builds, and generally are more actively pursuing these than their private sector counterparts.

SIZE OF PROJECT

There is flexibility in some municipalities to undergo projects under a certain budget without council approval. These amounts range by municipality. In these cases, decisions are at the discretion of the facilities manager (or equivalent / similar role).

GHG REDUCTION

While cost was a key consideration in the past and continues to be an important driver, given municipalities' ambitious net zero or GHG reduction goals, emission reduction can be a key driver in energy project decisions.

Natural Gas vs Electricity Projects

There is interest in pursuing opportunities that align **electricity and natural gas conservation projects** – be it from a planning standpoint or in working collaboratively with IESO, rather than treating these as siloed items – resulting in projects that can combine both, and more efficient processes / projects.

"[…} if they could work with the IESO it would be great if it was a one stop rebate program type thing, that could work.

Unaided feedback and comments were made about **Enbridge Gas' incentives and programming being more flexible and easier to pursue** than electricity ones with longer review periods and an overall more difficult process.

"[Enbridge's] process for incentives is super easy, like it's fantastic. Especially compared to the electricity one, it's just a lot easier to get incentives from Enbridge. […] I know in the past I've been able to apply for incentive after a project is already complete […] for the electricity ones they make me apply and get everything approved before I issue the purchase order to the contractor so it can be very difficult in some cases to get your project approved in the right sequence. They will work with you but it's still kind of a pain."

Because of the high cost of electricity in Ontario, this is key a factor in prioritization of projects – minimizing the cost impact of electricity consumption in municipally owned buildings is of great importance.

However, while past emphasis may have been placed on electricity projects, **there is greater interest and emphasis by many on natural gas conservation projects** – or they are pursued in tandem with electricity projects – in order to reduce GHG emissions.

"[…] obviously, no surprise, the focus is now shifting to emissions, and emission reduction. And that's becoming a higher priority than just energy alone, or energy intensity alone. And so, the shift is on this decision-making process […] The questions are starting finally to be asked.

"Right now with my current [net zero] directives I'd be much more interested in spending money on a natural gas reduction than electricity one."

Benchmarking

Benchmarking is not considered a key driver of energy efficiency measures or projects. Although all participate in reporting energy use for their municipally owned buildings to the Ministry of Energy, this does not act as an incentive in terms of improving their scores – partially because they are actively pursuing energy conservation regardless, and partially because many view this activity as a necessity to meet provincial requirements, but don't check on their scores annually – in fact, a few were unaware that this is an option.

Some municipalities are aware of how their municipality is doing in comparison to others. They keep up with what their peers and colleagues are up to as it relates to sustainability and energy conservation, and they share best practices and work collaboratively to meet common goals. In some sense, they consider environmental concerns and benefits "borderless".

[Provincial benchmarking] helps seeing that every year where we are in terms of cities, but you have to keep in mind that with the DPS reporting its one and a half years back. So for 2020 the one I did this year, I was doing 2018 reporting so I'm already a year and a half back. So it's not really giving me real time information and at the same time I'm checking myself anyways […]

Mention was made that there is a gap in terms of knowing what energy efficiency and conservation activities are being undertaken by other municipalities, and this is an area of interest. For example, it would be helpful to know if a technology had been used in a similar building and what the outcomes were, so that they could know whether to invest in it as well.

As well, the smaller municipalities within the larger Region (such as Durham or Waterloo) and the Region itself can sometimes work together on various initiatives. That said, there was acknowledgment that this could be an area of improvement in working together with the municipalities within a Region to ensure alignment.

Yeah, they don't really do anything with the data to present it back to us in a way that actually enables comparisons across asset classes, which would actually be very useful. Like how do child centers compare against each other in York, Durham, Peel, whatever. Like I mean it's disappointing that they actually haven't made the data useful for us, because now… it just feels like a bit more of a make work than an actual value-add exercise. […] I think the province could do a lot more with that data to actually make it something that generates insights and motivates behaviour change.

Tools and Resources

Use of tools and resources was mixed across municipalities with varying levels of use and sophistication. Larger municipalities have more "in-house" resources, but these can be scattered and not centralized, while smaller municipalities are more self-sufficient which allows for a more centralized and unified approach to energy efficiency.

BAS (Building Automation System) – use of these was mixed – many had some form of BAS in place but not for all of their municipally owned buildings. Some were able to leverage the information to better manage energy consumption, while others found BAS less useful for this purpose as the system was outdated and/or the buildings themselves were quite old, making it difficult to take advantage of a BAS system.

Maintenance or Operations Staff – facility maintenance is rarely outsourced, and most municipalities have staff who operate municipally owned buildings, be it dedicated onsite staff or those who move between buildings.

Mention was made in training gaps for public institutions on HVAC given the unique nature of the buildings in a municipal setting. There were also concerns / hesitation about adopting new technologies where stakeholders are unsure about if / how new equipment can be serviced.

Energy Management Information Systems (EMIS – use of these was mixed – some have these in place, and these were mostly using third party software, although a few had developed EMIS of their own – these were the most sophisticated and useful systems. Some did not have any centralized or comprehensive EMIS in place or struggled to make use of the data produced. Others had EMIS that tracked their monthly utility bills, but these were more difficult to leverage in terms of using this information towards energy efficiency goals.

Amendment 15

It would [be applicable to us] but it wouldn't really affect us because we generally replace with condensing boilers which are higher efficiency than that.

Yes that would be something that would be applicable to us because we do have facilities that are heated by heating boilers so yeah, obviously that's something that […] we will need to get information on and look into to ensure that any boiler heating systems we have would reach that target.

So NRCAN may have passed that, but is that part of the Ontario building code? […] It's a regulation that doesn't have any [building code], it's not enforceable. So I would say that's my concern. If it's not in the building code, it's not enforceable. And so, that's a big concern.

Awareness of Amendment 15 and the upcoming changes to NRCAN requirements was low. Having heard about it during the interview, a few indicated they would look into this further.

Reactions were mostly muted in that many municipalities felt that they are already compliant with the requirements, and that the equipment they install is already 90% efficient – or that they would be able to meet the targeted date for any equipment that is not currently at those standards. A few felt that this is a positive change and applauded the requirements as being helpful to the environment.

A few municipalities expressed concern about Amendment 15 and their ability to make the required changes within the timeframes outlined, and in particular, whether or not their municipality would be able to afford to replace their equipment, given already tight budgets.

Mention was made that unless these requirements are added to Ontario building code, it will be very difficult to enforce uptake of this change.

Technology

ENBRIDGE

New technologies

Municipalities are generally more open to investigating and adopting new technologies than their private sector counterparts. Although they may have budgetary constraints, they are in general always discussing and finding new ways to reach their conservation goals – for a few it is an area that generates excitement.

Desire to have Enbridge Gas incentivize or create programs for these is high.

"I'm getting excited. I hope you mention all the good ones."

New technologies mentioned as being of interest by stakeholders included:

- District Energy
- Hydrogen
- Renewable Natural Gas
- Solar Voltaics
- Thermal Energy Storage
- Battery Storage (for electrification of transit vehicles)
- Energy recovery and heat recovery ventilators
- Building envelope
- Biomass
- Energiesprong (Netherlands)

Mention was made of thinking more "big picture" as it relates to conservation programming – not just focusing on incremental savings.

"In general we want to encourage more longer term planning and projects that drive bigger action rather than smaller incremental savings. So program wise, that might be focusing on building envelope upgrades or moving to much more efficiency technology. There is an issue where…buildings are moving to marginally more efficient equipment and that locks in using that equipment for the next 20 or 30 years because of that equipment lifetime. They aren't incentivized to make an upgrade again."

Ipsos

Technology cont'd

Heat Pumps

Awareness of heat pumps was high, and many had already considered or installed these in their municipally owned buildings. Most were aware of electric heat pumps while awareness of gas ones was lower.

Heat pumps are considered a highly efficient option, not only in lowering consumption but in lower emissions as well.

Drawbacks for electric heat pumps is in the cost, particularly on peak days, and in local distribution issues. They are not considered a good option for northern municipalities in colder climates as they are perceived to only be effective up to a certain temperature.

I definitely think the technology in the last few years means that for electric heat pumps they could provide all the heating needs for many types of buildings. Larger buildings will struggle with something like that. You still might need another fuel source. Gas-fired heat pumps are also interesting technology because the efficiency level of these is much higher than standard gas equipment. These aren't common in the market but it would be great to see these as a more commonly used technology.

Geothermal

Awareness and uptake of geothermal was similarly high.

Barriers to this technology were mostly about cost and required capital. There was less feasibility concern than in the private sector, as municipally owned buildings would have the required space for geothermal. It is also dependent on whether the ground itself is suitable (i.e., not on rocky terrain).

[Geothermal] does have a very, very high capital cost but when you're building a building that you hope is going to last 60 or 70 years, then not as big a deal or as big a concern. So, yes, we do certainly look at that if the building is appropriate.

[…] it's a risk to undertake a new geothermal system especially on an existing building. So there needs to be more work upstream getting proper drillers, designers, and getting existing designers to know what it takes to design these things and also expand outside just the piece of equipment and incentivizing that, but enabling pieces, the fundamental enabling pieces around it - insulation and making buildings more efficient. That's across the technology types. But especially for geothermal you're going from high temperature to medium or low temperature heating source.

Technology cont'd

ENBRIDGE

Solar Walls

Awareness of solar walls was mixed and in general, there was more openness to this technology than in the private sector with a few municipalities who had installed these. Since these are fairly new, assessment of whether or not these have been successful has not yet occurred and is still being determined.

These are generally considered more feasible on new builds than existing ones. It is considered a "passive technology" which is an advantage. The payback period on solar walls is perceived as poor, although there are specific situations in which it works well and is suitable.

It kinda comes down to the same thing with solar, thermal or pools or hydronic solar thermal systems. The price of natural gas is pretty low. The heat you get out of the sun to use is at a time you don't really need a lot of heat. And it's really hard to store up that volume of water to push it into evening or early morning. So it's just not economically viable. It's free getting energy from the sun but it's hard to justify the investment for collecting solar thermal energy in Ontario. That has to change with the high uptake and cost of alternatives where going to electric maybe makes more sense than going to the sun.

VRF

Awareness of VRF was mixed, with a few who had installed this technology in buildings and others who are considering doing so. It was considered suited for buildings that don't need to run continuously (i.e., are not always occupied).

Benefits are in terms of the efficiency of the technology and lower emissions, and in the ability to move heat around without having to create new heat.

Drawbacks were that it is a not a commonly used technology in Ontario and there were concerns about maintenance and operations.

Yeah, VRF, that's something newer that I've seen being used a little bit more in commercial buildings and stuff like that, and obviously in residential buildings with multi-head heat pumps, or even single-head ones. There's the benefit obviously that you can with a fully-piped VRF system, you can move heat around in the building before creating more or expelling it.

Drawbacks are, even though it's not new technology, I think the local markets and the supply community, from contractors to parts supply and that sort of thing, that is a bit of a risk to me. It's not a dealbreaker, but it's a concern for me, for sure.

Ipsos

Enbridge Gas Programs

Most municipalities are aware that incentives are available through Enbridge Gas for natural gas conservation projects. **Greater awareness was driven by having a close relationship to their account representative, as compared to those who had less direct contact with Enbridge Gas and hence, less awareness**. Municipalities of every size find incentives invaluable and there was a misconception among smaller municipalities that larger ones have bigger budgets or more available funds to spend on energy efficiency initiatives. One municipality set aside any incentives received from Enbridge Gas to fund additional energy efficiency projects, rather than putting them towards the bottom line while another did not see any benefits to their department as any savings realized goes into the larger municipal pool rather than back to them to use at their discretion.

Incentives to fund new technologies were of particular interest, given that these can be costly to pilot and install, particularly in early iterations where initial costs are higher than subsequent versions.

There were few barriers mentioned in terms of program participation – **the greatest ones were related to cost, with most juggling various needs, opportunities and projects at any given time.** Bureaucracy can be a barrier to smooth and efficient program participation in the largest municipalities but is not a factor for most. For one municipality, they do not have any energy efficiency goals or targets as they are currently barely able to afford maintaining their current assets – and so they feel they can simply not afford to undertake any energy conservation initiatives in their municipality which is not experiencing any growth.

[…] there's different grants out there or incentive programs out there that usually you can partner up with. So if you do this sort of work by this time you can become a part of that incentive program which helps cover the cost of those potential projects. When you can present that to council where they don't need to come up with 100 percent of the cost for the capital project and some of its being offset by a grant or incentive that's definitely a factor that's going to help with the selection of the capital projects.

Incentives are a really good way to encourage consumers, make it more visible to consumers. People are always looking for the best financial case. Everything comes back to money […] The business case is really important to us. Probably less important than a private company or residential consumer because we can look at the longer payback timelines. Municipalities have a low cost of borrowing and are looking at keeping buildings for long timelines we can look at those longer term projects.

Enbridge Gas Programs cont'd

Savings by Design was mentioned unaided several times as an invaluable program that has supported municipalities as they plan and design new municipally owned properties – it makes logical sense to consider energy efficiency from the outset in the original building design – as opposed to trying to find opportunities after the property has been built. For new builds, consideration is given to all feasible, energy efficient technology options – they don't simply replace like for like in terms of equipment. This is much more easily accomplished than on retrofits.

Energy audits such as building condition assessments are often conducted by municipalities for various purposes. These are done both internally, and by third parties. These can help, although are not always required, to help build business cases to municipal councils for energy and/or capital projects. They also help feed into the capital planning process in terms of understanding which assets may need to be replaced.

Mention was made that these are not always valuable in identifying opportunities other than ones that are obvious or simple. They are also less valuable or not worth paying for on small buildings with simple designs requiring less detailed audits.

I always consider every technology for that's not there for any, especially for anything moving ahead. Always see different options of just the highest efficiency boilers or is it something else, but it has to fit in with our budget, with our goals and also sometimes the infrastructure is hard to even harder to replace. Especially with retrofits it's a bit harder because, I mean, infrastructure is already in place for natural gas pipelines so it can't really be much worth it but with new buildings it's almost like an open slate, it's a lot easier I find. So opportunities with new builds are a lot easier in terms of picking technology and you have more flexibility but terms of retrofit it's mostly, how are you replacing this equipment for just more efficiency.

I can go in and look at all the specific items in there that were audited through building condition assessment […] basically [it] looks at every type of asset inside a building, and gives you the age of the doors, and the replacement value of the boilers, obviously what we're interested in operating equipment. But this data is for the roof, the windows, the flooring, every little bit of asset is outlined in a condition assessment. And those condition assessments form the basis for our facility index, if you will, and the status of our current buildings across the portfolios, drilled right down to each building.

Enbridge Gas Programs cont'd

Most municipalities outsource at least one or more services on energy efficiency projects or in the design, build, or maintenance of municipally owned properties – this varied although many did not have designers or engineers on staff. **Trusted sources of information included vendors, engineers, utilities, and other municipalities or colleagues**. Those with a direct positive relationship with Enbridge Gas rely on their representatives for identifying incentive opportunities, but awareness of other available services, and use of them, was mixed.

When finding vendors for various projects, all are bound by **public procurement rules** in that they cannot simply hire a preferred vendor for a project without going to tender or RFP. Some do have a pre-qualified roster of vendors. Few had any maintenance or other ongoing contracts. One disadvantage identified in the procurement process is those municipalities that require or favour the lowest cost option, especially as the lowest cost option may not be the most energy efficient / lowest emission one.

Having Enbridge Gas provide technical expertise or support was of interest, given that there often already a positive relationship there and high levels of trust.

So I usually, depending on the project most of the time we rely on our consulting engineers. I tell them what our goals are and this is what we're looking for and recently its' gone quite well and they've said here's some options, here's some costs, what do you think is the best route to go and we have some back and forth that way. And then we also use commissioning agents for that kind of thing to do design review for us as well. And then the municipalities […] different municipalities talk to each other and we share our stories of bad and good so.

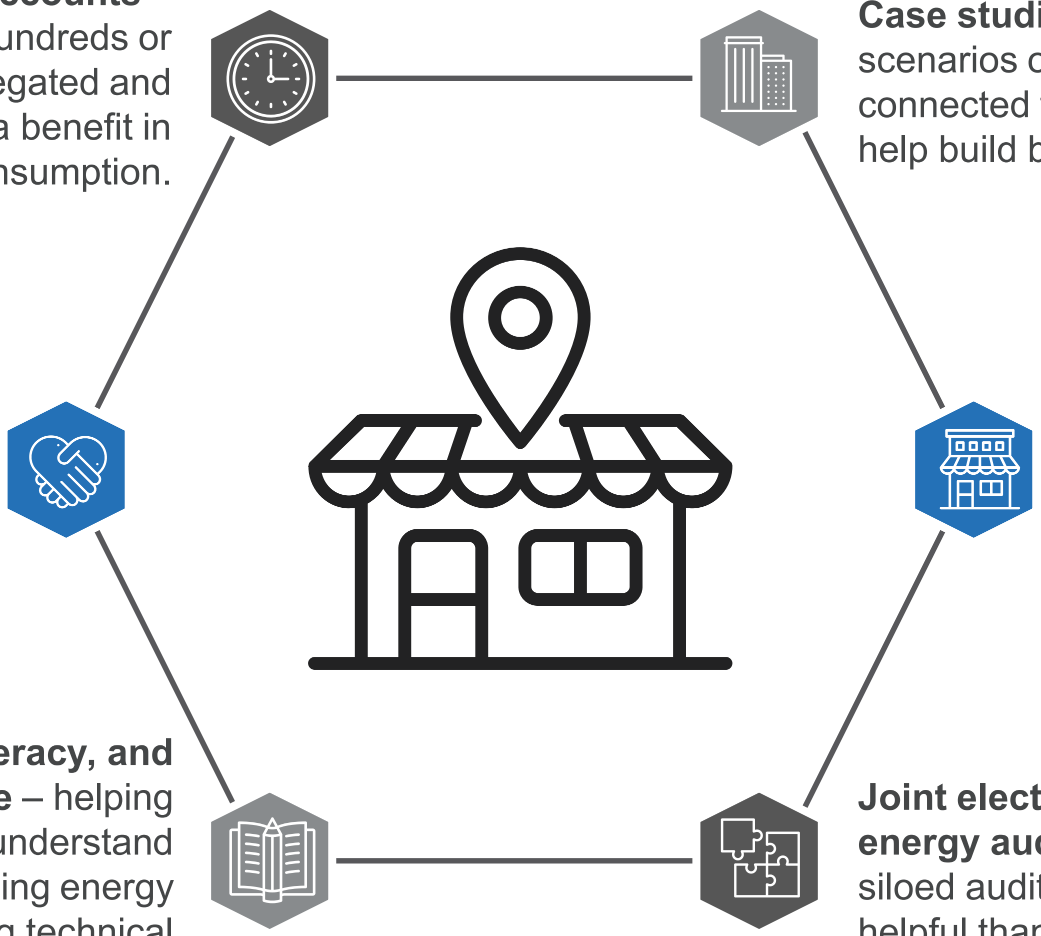
[…] it would be a nice place to start because I think with the great thing about Enbridge […] I do think there's a trust factor right, like I'm not going to anybody, there's a trust factor, you guys have been in the business, you're a utility […] so I think it terms of, a level of comfort we are, I could say that, maybe not, because maybe they might push that natural gas product or the electrical one. But I think I definitely would be open to that.

Enablers

ENBRIDGE

Centralized data across multiple accounts – since municipalities can own hundreds or thousands of buildings, getting aggregated and actual (not estimated) data would be a benefit in understanding energy consumption.

Case studies involving specific scenarios or technologies, and being connected to the individuals involved, to help build business cases.



Revolving and/or dedicated energy manager - person/role to support municipalities and large businesses identifying opportunities, providing support on energy savings such as centralizing information for large municipalities.

Longer incentive and program windows to better align with municipalities' long term capital planning – as many plans and net zero targets are decades-long.

Program and energy literacy, and technical expertise – helping municipalities and the public understand available programs, increasing energy literacy generally, and providing technical expertise.

Joint electricity and natural gas energy audits – rather than conducting siloed audits, which are considered less helpful than more holistic ones.

Ipsos

Retrocommissioning and Operations

Many were aware of retrocommissioning and among these stakeholders, views were generally favourable. Some have already undertaken retrocommissioning initiatives in their municipally owned building or expressed interest in the idea.

Among those who were unaware of retrocommissioning, they found this idea appealing and thought it sounded worthwhile as it makes sense to identify operational efficiencies, particularly given the age of some of their properties. Having Enbridge Gas support retrocommissioning initiatives would be of interest.

Yeah, we do that, we're always re-commissioning our buildings. Sometimes you get a nice low cost, almost no cost energy measure and conservation measure and we just try and see if the building's operating as per design and where we could tweak and usually we get a quote, 5 to 10 percent, but if we're lucky maybe 15 percent savings. In terms of energy. Like considering sometimes I would like to do more for sure. I do think it's very easy to, I shouldn't say easy, from a cost perspective it's easy and for what we get out of it I think it's beneficial.

As with private sector stakeholders, most larger municipalities often have onsite operations of facility management teams who are on the ground and have a deep understanding of the facility, and they can be the ones to bring operational efficiencies or energy conservation ideas to the table. A few smaller municipalities have outside maintenance contracts.

However, mention was made that these can also be mobile or entry level roles where it is challenging to motivate staff to care about energy efficiency such that they run the facility accordingly, and that these roles can lack continuity over extended periods of time.

So, we have a few different groups in terms of facility operations and, you know, they manage their staff and their activities independently. However, we do offer, we can act as a technical resource for those groups when they are looking to implement or evaluate energy related projects. And then they will come to use or some of the other people in the organization, and we can help them with evaluating those types of things.

There is a lot of pre-work you have to do to create the conditions to move ahead with a comprehensive energy management system. Ultimately it boils down to the facility level. You have to have people with a vested interest in month-to-month energy performance improvements and from top to bottom of the organization.

Collaboration

[Green Will] essentially a building portfolio program we're working on with a lot of the larger stakeholders across the City. The idea is we'd work directly with the executive team at these organizations to embed strategic energy management practices and then have those improvements trickle down to individual buildings. A big part of the program is really to recognize and disclose everything these portfolios are doing to get them to keep doing more, to continuously improve their performance and really factor in energy and carbon performance into their long-term planning. Because these are very large portfolios they have a lot of expertise, a lot of things to say, a big part of this program is also the collaboration piece where we bring them together, have them talk to each other and work on things.

Interest by municipalities in collaborating with Enbridge Gas is high. Some already feel they are working collaboratively with Enbridge Gas and these are considered positive and productive relationships. Further opportunities might include:

- AMO (Association of Municipalities Ontario)
- Mayor Megawatt Challenge
- Clean Air Partnership
- Green Will Initiative
- Toronto and Region Conservation Authority's Sustainable Neighbourhood Action Program (SNAP)
- Municipal Board of Trade
- Municipal Energy Plans (providing input)

Collaboration

Any times we did […] if we're doing a big development in the city, sometimes we're looking into district energy, we always have someone from the Enbridge, and always electrical utility too, you always have one of them at our, one representative of each at our discussion. And they talk about Enbridge's point of view, especially with the pipelines, anything pipelines related, what to look out for, that kind of stuff. So it really helps facilitate it […]

[…] Enbridge has a role to play [in community energy], the city has a separate role to play, and we need to be on the same page, and go hand in hand as we roll out these programs and initiatives, and the communications around them.

Those who do not have direct, frequent contact or a close relationship with Enbridge Gas representatives are open to, and would welcome, proactive outreach to establish a trusted connection.

Among those who already have collaborative relationships, these are valued as bringing expertise and opportunities to the table, and mention was made of account representatives connecting stakeholders to other individuals inside Enbridge Gas as needed. They were eager and open to expanding these relationships even further to be broader and more holistic, and not just focused on incentives.

Mentions were made among former Legacy Union Gas customers of some confusion or uncertainty about who their representative is, having dealt with new or a few different individuals since the merger; that said, they were understanding that there would be a transitional period.

One area of interest for certain municipalities is in partnering on community energy initiatives – that is, reaching residential and business customers of the municipality. This includes education and awareness of the benefits of energy efficiency and emissions reduction and enabling / creating programs or measures that help drive GHG reduction in the community at large – and not just within municipally owned buildings. For these stakeholders, there is a perceived gap in programming on residential natural gas conservation programs.

About Ipsos

Ipsos is the third largest market research company in the world, present in 90 markets and employing more than 18,000 people.

Our research professionals, analysts and scientists have built unique multi-specialist capabilities that provide powerful insights into the actions, opinions and motivations of citizens, consumers, patients, customers or employees. Our 75 business solutions are based on primary data coming from our surveys, social media monitoring, and qualitative or observational techniques.

"Game Changers" – our tagline – summarises our ambition to help our 5,000 clients to navigate more easily our deeply changing world.

Founded in France in 1975, Ipsos is listed on the Euronext Paris since July 1st, 1999. The company is part of the SBF 120 and the Mid-60 index and is eligible for the Deferred Settlement Service (SRD).

ISIN code FR0000073298, Reuters ISOS.PA, Bloomberg IPS:FP
www.ipsos.com

Game Changers

In our world of rapid change, the need for reliable information
to make confident decisions has never been greater.

At Ipsos we believe our clients need more than a data supplier, they need a partner who can produce accurate and relevant information and turn it into actionable truth.

This is why our passionately curious experts not only provide the most precise measurement, but shape it to provide True Understanding of Society, Markets and People.

To do this we use the best of science, technology and know-how and apply the principles of security, simplicity, speed and substance to everything we do.

So that our clients can act faster, smarter and bolder. Ultimately, success comes down to a simple truth:
You act better when you are sure.

ENBRIDGE GAS DSM PLAN -- INDUSTRIAL PROGRAM

Industrial Sector Strategy

1. Enbridge Gas's proposed Industrial program is an evolution of the existing Industrial program with an enhanced focus on addressing market barriers and engaging a broader group of customers.

2. The following inputs were taken into consideration in the development of the proposed Industrial program:
   - The objectives outlined in the OEB's December 1, 2020 letter;[1]
   - The guiding principles outlined in the Proposed Framework;[2]
   - Lessons learned by Enbridge Gas through delivering programming to the industrial sector for over 25 years;
   - Learnings from evaluation studies conducted throughout the 2015-2020 Multi-Year DSM Plan; and
   - Feedback from stakeholders 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.

Market Overview

3. The industrial sector across the Enbridge Gas franchise amounts to more than 22,000 accounts that collectively consume 6.34 billion cubic meters of natural gas annually.[3] Industrial customers are considered facilities involved in the production or

---

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), pp. 2-3.
[2] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, pp. 5-8.
[3] These values are exclusive of customers and related consumption in Union rate zone R100 and T2 who are addressed directly through the Direct Access offering in the Large Volume Program.

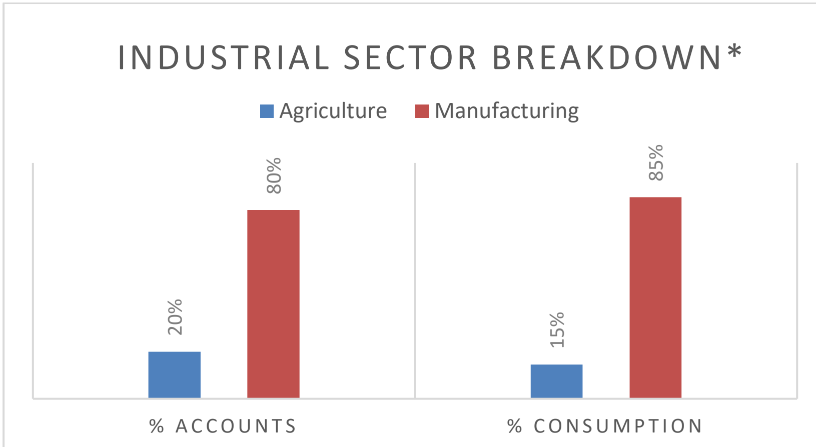
enhancement of mercantile goods. The industrial market can be broken out into two market segments: agriculture and manufacturing.

4. Agriculture customers are facilities that cultivate plants or livestock such as greenhouses and poultry farms. They represent approximately 20% of accounts and 15% of gas consumption within the industrial sector. Customers in this segment have traditionally been more receptive to participation in DSM programs, as natural gas costs represent a high proportion of overall production costs due to the significant heating loads required year-round to support an optimal cultivation climate for crop production.

5. Manufacturing customers include all other types of industrial facilities such as automotive, pharmaceutical, asphalt, packaged goods, pulp and paper, and food/beverage/confectionary production plants. Manufacturing customers represent approximately 80% of accounts and 85% of gas consumption within the industrial sector. These customers can be most usefully segmented by annual consumption patterns since customers with similar load profiles will typically have similar energy solutions needs. Larger industrial customers, typically those with baseload consumption profiles in excess of 10,000 m^3/year are considered to have year-round process-related gas loads; whereas smaller industrial customers with lower baseload consumption profiles use most of their natural gas for space heating, and therefore have seasonal dependent loads.

6. Table 1 below shows a breakdown of the industrial sector illustrating the distribution of accounts and their annual gas consumption loads.

Table 1



*These values are exclusive of customers and related consumption in Union rate zones R100 and T2 who are addressed directly through the Direct Access offering in the Large Volume Program.

7. Industry in Ontario has declined over the past decade as U.S. demand for Ontario manufactured goods has decreased and global market pressures have caused manufacturing to be outsourced to countries with less labour, safety and environmental regulations, and more economic incentives to support local manufacturing.[4] While the overall manufacturing sector continues to see reductions, a variety of industries catering to local needs such as agriculture and fresh food production are experiencing growth. Future DSM results in the industrial sector should therefore focus on growing markets and finding ways to increase penetration of existing customers.

8. The full impacts of COVID-19 on the industrial sector have yet to be realized and could significantly impact the number of accounts through business closures in each segment as well as exacerbate key barriers, especially financial constraints associated with investing in conservation measures. In a recent survey conducted

[4] Manufacturing Ontario's Future: Leveraging Ontario's Manufacturing Sector to Drive Ontario's Economic Success, Canadian Manufacturers & Exporters (2018), p. 10.

on behalf of Enbridge Gas by Ipsos (Attachment 1) it was identified that as many as 23% of industrial customers claimed that the pandemic delayed their plans to make energy efficiency upgrades and 3% had to cancel their plans completely (Attachment 1, page 43).

<u>Lessons Learned</u>

9. The most predominant barriers limiting participation in DSM programming for industrial customers can be addressed by considering the following questions: Is the customer aware of the program? Does the customer understand how the program can benefit them? Does the customer have sufficient resources to participate in the program? Enbridge Gas continues to work to address these three barriers as follows.

Market Awareness of the DSM Program

10. Industrial programs are delivered by Enbridge Energy Solutions Advisors ("ESAs") who work with customers on a one-to-one basis to address the unique processes and opportunities within each customer facility. Prioritization of Enbridge Gas resources has traditionally focused on the largest customers within the sector with the most savings potential, limiting broad awareness and participation to those customers targeted by ESAs.

11. Additional resourcing and renewed focus will be placed on supporting customers who have not previously participated in DSM programming. Although this effort aims to increase participation over time and uncover new opportunities, it is also expected to increase the overall cost of the program, with a reduction in average project size and associated cost-effectiveness.

12. Smaller industrial customers with predominant space heating loads are more akin to a commercial warehouse facility than a large industrial plant. As a result, these

customers will be eligible for Enbridge Gas's Commercial Prescriptive Downstream, Prescriptive Midstream and Direct Install offerings that allow for broader participation and reach among smaller customers through engagement with alternative delivery channels.

Communicating the Value of Energy Efficiency and DSM Programming

13. Energy typically accounts for just one to two percent of production costs for the bulk of manufacturing sub-segments,[5] and natural gas represents only a fraction of overall energy used, which makes prioritizing natural gas efficiency challenging in the face of competing capital and operational improvement initiatives. Furthermore, some customers are of the belief that their sites are already operating as efficiently as possible. Others are reluctant to introduce new technologies or measures due to skepticism of achievable savings and/or concern about unforeseen impacts to production.

14. Some of these challenges can be overcome through educating the industry about best practices in energy efficiency as well as quantifying the energy and non-energy benefits realized by those who engage in DSM programming. Enbridge Gas accomplishes this by hosting customer workshops and webinars focused on industry relevant topics. Case studies, technical documents and best practice guides are also developed to provide illustrations of different efficiency opportunities that may exist within a plant, detailing the energy and non-energy benefits that have been achieved by former participants of Enbridge Gas's DSM programming.

[5] Chart of the Day: The Manufacturing Cost Components for a Bunch of Different Things, Sam Ro (May 1, 2013) Source: US Census Bureau, Morgan Stanley Research https://www.businessinsider.com/chart-the-cost-of-manufacturing-stuff-2013-4

Addressing Resource Constraints

15. Industrial customers often lack the technical expertise and/or internal resources to support the identification, quantification, justification and implementation of energy efficiency projects. Furthermore, even when a project is identified, financial barriers such as internal competition for limited available capital, tight financial planning cycles, and the low cost of natural gas relative to other expenses impact DSM program participation.

16. Enbridge Gas's ESAs work with customers as an extension of their team, and provide support to help identify, quantify, and develop an implementation plan for efficiency projects. As summarized in the Ipsos April 2020 Qualitative Research Report (see Attachment 2), "Many participants rely on Enbridge and other utility partners to 'fill in the gaps' in terms of knowledge, tools, and resources to undertake conservation projects. This might include support and expertise in conducting assessments, putting together the figures and numbers to build a business case, in recommendations for third party contractors and experts, and in understanding industry-specific or general best practices. A few characterize these as equally or more valuable than financial incentives" (Attachment 2, page 17).

17. In addition to technical and execution support, Enbridge Gas's Industrial program provides financial incentives to offset the incremental costs associated with implementing energy efficiency projects. Proposed incentives are being increased in an effort to bring down project payback periods to more inviting levels and increase overall participation in programming.

<u>Industrial Program Proposal</u>

18. Enbridge Gas believes that the Industrial program is best positioned to support larger industrial customers, as it allows for the 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 ESA as well as financial incentives to overcome key barriers associated with the identification, quantification, justification, and implementation of energy efficiency measures.

19. Enbridge Gas believes that the role of ESAs, working with industrial customers year over year to drive continuous improvement, is one of the biggest contributing factors to the success of the Industrial program. As confirmed in the Ipsos April 2020 Qualitative Research Report, "the working relationship is often viewed as an ongoing partnership that has resulted in reduced consumption and real money savings" (Attachment 2, page 8). A continued focus on developing and expanding these one-to-one relationships will be a priority to broaden market reach and provide value to industrial ratepayers.

20. In addition to the Industrial program, industrial customers will be eligible to participate in the Commercial Prescriptive Downstream, Direct Install and Prescriptive Midstream offerings, however it is anticipated that the vast majority of projects, especially involving customers with significant process loads, will require customized solutions engineered to address the specific characteristics of the varied operations and facilities.

21. A high-level description of the Industrial program as well as key elements associated with the offering are listed below in Table 2:

Table 2

Offering Name	High Level Description	Key Offering Elements
Industrial Custom	The Industrial Custom offering applies a continuous energy improvement approach to help industrial customers improve natural gas consumption efficiency by identifying, quantifying, and incentivizing energy efficiency projects.	Long term customer support by Enbridge Gas ESAs for engineering, technical and business support of energy efficiency projects including, financial incentives for projects, sub-metering support, studies, and energy management tools (Energy Management Information Systems or EMIS).

OEB Objectives and Guiding Principles

22. The Industrial program has been designed to address the OEB's primary objective for DSM programming, "assisting customers in making their homes and business more efficient in order to help better manage their energy bills."[6] The program also addresses the secondary objectives that include that DSM should "help lower overall average annual natural gas usage" and "play a role in meeting Ontario's greenhouse gas reductions goals."[7]

23. Industrial customers represent some of the largest gas consumers in Ontario, and therefore present significant gas savings potential. They are among the most challenging to support as a result of the need for a custom approach to address the unique characteristics of each facility and processes therein. Enbridge Gas has proposed a distinct Industrial program to ensure appropriate effort and resources are allocated towards maximizing savings potential within the sector and supporting

[6] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[7] Ibid, p. 3.

customers in driving deep energy savings through a continuous energy improvement approach.

24. The Industrial program also addresses the guiding principles outlined in the Proposed Framework including:

- DSM plans should include strategies to increase the natural gas savings by targeting key segments of the market and/or customers with significant room for efficiency improvements.[8]
- DSM plans should minimize lost opportunities for energy efficiency and should be designed to pursue long term energy savings.[9]

Industrial Custom Offering

Background

25. Historically, both Union and EGD rate zones have had great success across the province in applying a custom approach to assist industrial customers in undertaking energy efficiency projects and realizing significant natural gas savings. The proposed Industrial Custom offering will continue to provide industrial customers with the technical engineering support of an ESA, as well as financial incentives, to promote the implementation of energy efficiency projects and realize meaningful gas savings. Improvements to the Industrial Custom offering have been made to align the offering across the franchise-area with a universal set of eligibility criteria, educational and technical support initiatives, and enhanced incentive structures.

26. Enbridge Gas retained Ipsos to undertake two market surveys to understand evolving customer and market needs as part of its continuous improvement

---

[8] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, p. 7.
[9] Ibid.

practices. The Ipsos April 2020 qualitative research report (Attachment 2) focused on the experience of Enbridge Gas's larger industrial customers, and a second qualitative research report in 2021 (Attachment 1) gauged the broader industrial market to ensure findings from the 2020 research were largely applicable to the sector. Many respondents in the surveys noted that the technical assistance provided by Enbridge Gas ESAs to identify and quantify energy efficiency opportunities was equal or in some cases more influential in driving positive outcomes than the financial incentive.

27. This customer feedback confirms that industrial customers highly value the technical expertise and assistance provided through the Industrial Custom offering. To further enhance the value of the offering, Enbridge Gas has included enabling initiatives, such as EMIS funding, previously offered in the discontinued Strategic Energy Management ("SEM") and Comprehensive Energy Management ("CEM") offerings to further assist customers in identifying and measuring savings opportunities.

28. Although the Industrial Custom offering has been, and is expected to continue to be the most cost-effective offering across the DSM portfolio, overall cost-effectiveness has been declining as a result of a variety of factors:

- Enbridge Gas has been delivering DSM to the industrial market for over 25 years. Although significant opportunity continues to exist within the sector, as Enbridge Gas continues to work with customers on implementing opportunities, it is only reasonable to expect returns to gradually diminish over time.
- In 2021, Enbridge Gas adjusted the new construction greenhouse baseline assumptions to accommodate for advancements in standards. This adjustment resulted in a significant reduction in claimable savings associated with greenhouse new construction projects.

- The Evaluation Contractor's ("EC") 2018 custom Net-to-Gross ("NTG") study demonstrated significantly higher estimated free ridership results for manufacturing projects completed within Union rate zones than previously, negatively impacting overall net results and cost-effectiveness of the offering.

29. Growth in natural gas savings results associated with the Industrial Custom offering will be driven by implementing measures to reduce free ridership and engaging a broader group of customers in participating in the offering.

Objective

30. The objective of the Industrial Custom offering is to support participants in achieving sustained and progressive energy efficiency by applying a continuous energy improvement approach. Participants receive a combination of technical support through a dedicated ESA and financial incentives to enable the identification, quantification, prioritization, and implementation of natural gas saving measures.

Target Market

31. The Industrial Custom offering is targeted to industrial customers, subject to eligibility details outlined below.

Offering Details

32. The Industrial Custom offering is delivered to customers through a combination of Enbridge Gas ESAs, customer outreach strategies and targeted communications initiatives. As part of its communication initiatives, Enbridge Gas provides customers with technical publications, case studies, quarterly updates, and in-person or online workshops to generate interest and awareness in the offering.

33. ESAs have developed long-standing relationships with industrial customers, supporting customers in the long term strategic quantification and prioritization of

energy efficiency opportunities in their facilities. This relationship is very important, especially for industrial customers who lack the time, resources and in some cases technical expertise to identify, assess and facilitate implementation of energy efficiency opportunities. An ESAs ongoing influence can help foster a customer's focus on comprehensive energy management and continuous energy improvement leading to that customer undertaking DSM activities year over year, driving incremental efficiency over time.

34. ESAs provide many services to customers to identify and quantify energy efficiency opportunities, such as energy consumption analysis and load profiling, site-walk throughs, plant and equipment testing and assessments, thermal imaging, and sub-metering of equipment. Engineering analysis, which serves as the basis for understanding energy efficiency opportunities, is also offered to assist in the development of a strong business case to pursue efficiency projects.

35. When more detailed engineering analysis is required, ESAs can connect customers with qualified vendors and offer financial incentives to cover up to 50% of the costs associated with energy audits, studies, sub-metering and EMIS systems to help quantify opportunities.

Eligibility Criteria

36. To be eligible for the offering, a participant must be an Enbridge Gas industrial customer.[10] Large Volume rate classes T2 and R100 in Union rate zone are ineligible for this offering and are supported directly through the Large Volume program.

[10] Industrial customers are non-residential customers involved in the production and/or enhancement of mercantile goods and/or the cultivation of plants and/or livestock.

Incentives/Enablers

37. There are two types of financial incentives available to participants: opportunity identification incentives and project implementation incentives. To support the identification of energy efficiency projects, where deemed appropriate by an ESA, financial incentives to cover up to 50% of the costs associated with third party audits, studies and metering (for example, air balance testing or steam trap studies) are available to help customers identify and quantify savings opportunities and justify project implementation.

38. Implementation incentives are calculated on a project basis and are based on estimated natural gas savings associated with the implementation of efficiency measures.

39. Enbridge Gas proposes the following incentive structure:[11]

- \$0.20/m^3 saved for the first 50,000 m^3 saved
- \$0.10/m^3 saved for each m^3 saved beyond 50,000 m^3

Conditions:
The overall incentive is capped at \$100,000 per project and should not exceed 50% of the incremental project cost.

40. Projects that yield less energy savings are likely to require higher financial incentives to cover enough of the initial project costs to assist in overcoming financial barriers. 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. This

[11] Incentives are subject to change and may evolve over time based on changing market needs. Limited Time Offers (LTOs) may also be made available to customers from time to time to drive adoption of specific measures and/or behaviors. Financial incentives should not exceed 50% of incremental project cost, unless otherwise specified through an LTO. Alternative incentive structures may apply to greenhouse construction projects.

enhanced tiered financial incentive structure is intended to make smaller energy projects more affordable, therefore enhancing reach and supporting industrial customers who are less likely to have previously participated in the offering.

Considerations for Continuous Improvement

41. Enbridge is proposing several enhancements to the Industrial Custom offering to optimize overall performance through a focus on free ridership mitigation strategies. Although Enbridge Gas has made significant improvements to address its project screening processes, the following additional measures will be included as part of the Industrial Custom offering in an effort to screen free riders and drive net DSM results.

42. In an effort to better understand the participation circumstances of customers, Enbridge Gas is hiring a third-party to conduct fast-feedback surveys to interview offering participants and assess the influence the offering had on the implementation of efficiency projects. The intent is to gather data that provides more clear, direct and actionable feedback than has typically been provided to Enbridge Gas through the NTG studies so that issues can be identified and addressed.

43. New construction greenhouse baselines have been adjusted to better reflect market standards and screen out projects that would otherwise be free riders.

44. The proposed harmonized tiered incentive structure is designed to cover a larger proportion of incremental project costs associated with smaller projects that would otherwise not yield reasonable enough payback periods to be implemented without Enbridge Gas's DSM support.

45. Finally, the proposed Industrial Custom offering applies a harmonized approach to project eligibility, screening and substantiation requirements that incorporates best

practices from each of the previously separate utility offerings. Examples of such initiatives include the universal adoption of a base case screening questionnaire as well as a formal offering agreement form requiring participant signoff prior to project implementation.

Metrics

46. The metric for the Industrial Custom offering is net annual natural gas savings, measured in m^3.

Gross Measurement

47. This offering will use several customized approaches as the basis for natural gas savings (m^3) gross measurement, examples include engineering calculations and energy modelling such as the USDA Agricultural Research Service's Virtual Grower, as determined appropriate by Enbridge Gas's technical experts.

Impact Evaluation & Verification

48. The most recent NTG study examining the Industrial program conducted by the EC was for the 2018 program year and was conducted for the separate EGD and Union rate zone offerings. Enbridge Gas recommends that the EC conduct a NTG study (including both free ridership and spillover) for this offering ideally following the first year of program implementation.

49. Enbridge Gas also recommends that repeated NTG studies are conducted for the offering throughout the term of the plan, however, Enbridge Gas recommends such studies are not conducted more frequently than every 2 years in an effort to minimize participant survey fatigue. The focus of the studies should be based on areas where the offering design has been changed.

50. Furthermore, NTG studies should provide detailed and transparent information at a segment level, in order to provide Enbridge Gas with program design information that can be actioned. Enbridge Gas also submits that it is critical that NTG studies are executed as close to project implementation as practical to ensure relevant and timely customer feedback is obtained. When the execution of NTG study is delayed, employee turnover at the project site can impact the quality of the responses and the study.

51. Enbridge Gas recommends that third-party verification studies (also known as Custom Project Savings Verification or “CPSV” studies) are appropriate for this offering given that most gross measurement claims are developed by the utility. Since Enbridge Gas has been conducting gross measurement claims for several years, and has been engaged in the ECs review of the utility’s gross measurement savings claims, Enbridge Gas submits that less rigorous, multi-year CPSV evaluations are appropriate in an effort to reduce participant survey fatigue and lower evaluation costs. The EC provided similar recommendations in the 2021-2022 DSM EM&V Plan: [12]

> The annual CPSV process has historically included an extensive evaluation effort to verify the savings achieved by custom DSM programs in C&I facilities. While the level of evaluation is warranted due to the portion of the gross cumulative portfolio savings represented by these programs (50% in 2018), consistent year-over-year verification results have demonstrated that a less rigorous process could be employed to provide similar value… The EC recommends that future evaluations implement a multi-year rolling sample methodology to determine custom C&I gross savings.

[12] 2021-2022 Natural Gas Demand Side Management Evaluation, Measurement, and Verification (EM&V) Plan, DNV GL (February 4, 2021), pp. 6-7. https://www.oeb.ca/sites/default/files/2021-2022-DSM-EMV-Plan-Addendum-20210204.pdf

Process Evaluation

52. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

ENBRIDGE GAS INC. DSM NEXT GEN CUSTOMER ENGAGEMENT

Industrial

Final Report

January 2021

Contents

METHODOLOGY & OBJECTIVES

Methodology & Objectives

- Enbridge Gas Inc. is undertaking a customer engagement process that is designed to understand industrial customers' needs and preferences as it develops plans for future energy conservation offerings. The goal is to understand customers needs and preferences and to consider these when making decisions around future energy conversation offerings.
- Overall, n=105 Enbridge Gas Inc. industrial customers completed the online & telephone survey between September 29th and December 8th, 2020. The online survey was in field between September 29th and December 8th whereas the telephone survey fielded from November 25th to December 8th. A total of n=64 customers completed the survey by telephone and n=41 did so online.
- The number of completed interviews by key segments are as follows:
  - By Size (annual consumption of natural gas, as identified by Enbridge Gas' internal data, and where not available by Q4 in the survey)
    - Small Customers (less than 500,000 m3): n=72
    - Large Customers (500,000 m3 or more): n=33
  - By Industry (self-identified by the customer in Q2 in the survey)
    - Manufacturing: n=50
    - Agriculture (including greenhouses): n=36
    - Other: n=19
  - By Legacy Utility:
    - Legacy Enbridge Gas Distribution: n=35
    - Legacy Union Gas: n=70

EXECUTIVE SUMMARY

Executive Summary

Most customers think managing natural gas consumption is important, yet only about half of organizations have a strategy or dedicated plan aimed at managing the amount they consume.

The most appealing natural gas conservation projects are ones that promote cost savings, enhanced safety, and improved efficiency as these attributes rank among the top motivators for implementing conservation projects or initiatives. About two-thirds of customers think they would know where to invest funds if they were given an unlimited budget to dedicate towards energy efficiency upgrades.

Customers will be turned off from investing in natural gas savings projects if there is no tangible return on their investment in the immediate or short-term future (i.e., within two years or less). Likelihood to invest in natural gas savings projects decreases as the time it takes for energy savings to cover the cost of the project increases. However, only a small majority think they would be able to estimate savings/ROI associated with energy efficiency upgrades and most indicate that a lack of time and resources hinders their ability to implement energy conservation projects or initiatives at their organization.

Even if operational efficiency or energy cost saving opportunities are identified, most small customers who own their building and use natural gas for heating or space conditioning would not be inclined to upgrade their heating/cooling equipment. In fact, two-thirds within this group would only make the upgrade if they felt like they had no other option (i.e., due to equipment burning out or reaching a point where there are too many maintenance issues). Additionally, most customers admit they only purchase energy-efficient equipment if it meets specific financial metrics such as payback or ROI.

Executive Summary (Cont'd)

Overall, most customers report having at least minimal awareness of the Enbridge Gas natural gas conservation offerings. Of those who are aware, the highest proportion cite an Enbridge Gas representative as the source of their awareness.

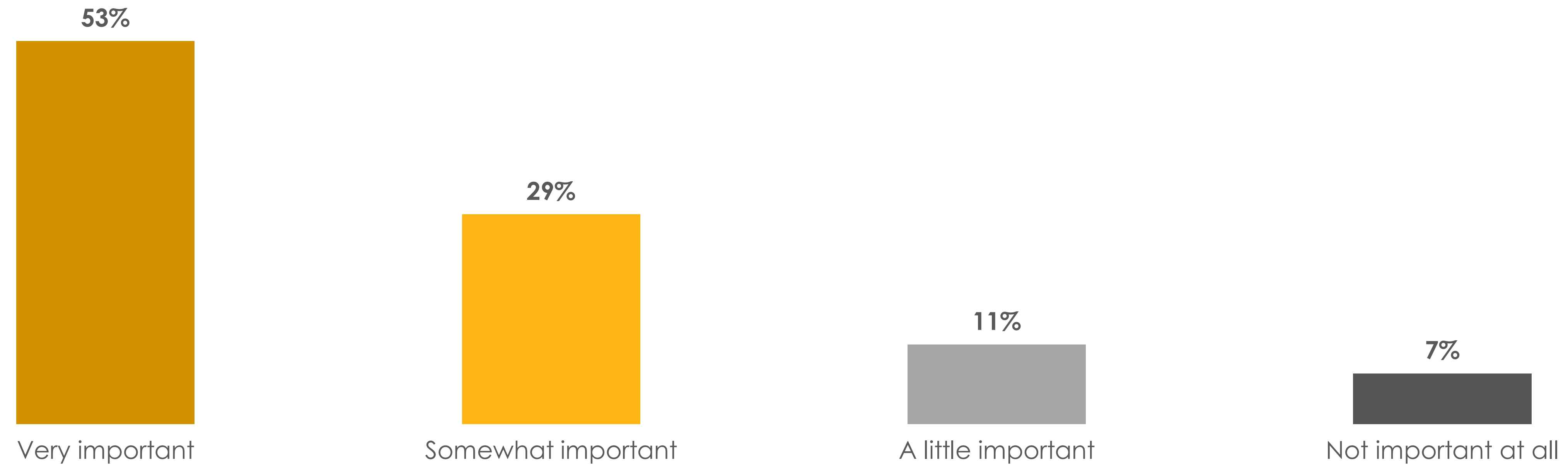
Fewer than half of customers have worked with Enbridge Gas in the past 2 years to implement natural gas conservation projects, though most of those who have done so were very satisfied with the experience. Irrespective of whether or not they have worked with Enbridge Gas, most customers think all of Enbridge Gas's natural gas program offerings or delivery elements are or would be important to their organization, save for the recognition activities. Most of those who have not worked with Enbridge Gas to implement natural gas conservation projects contend that not knowing enough about Enbridge Gas' offerings or having a lack of financial incentives proved to be at least somewhat of a barrier for their organization. Based on the feedback received in this survey, it would seem as though there is some room for improvement when it comes to the natural gas conservation program incentives in the eyes of participants.

COVID-19 has had an impact on planned energy efficiency upgrades, with considerable proportions delaying or cancelling planned upgrades due to the pandemic. Most large & small customers express interest in each of the specific program offerings, with the exception of technical workshops & webinars for small customers and having support in achieving certifications such as ISO5001, LEED, or Net Zero for large customers.

ATTITUDES TOWARDS NATURAL GAS CONSUMPTION & CONSERVATION

Importance of Managing Natural Gas Use

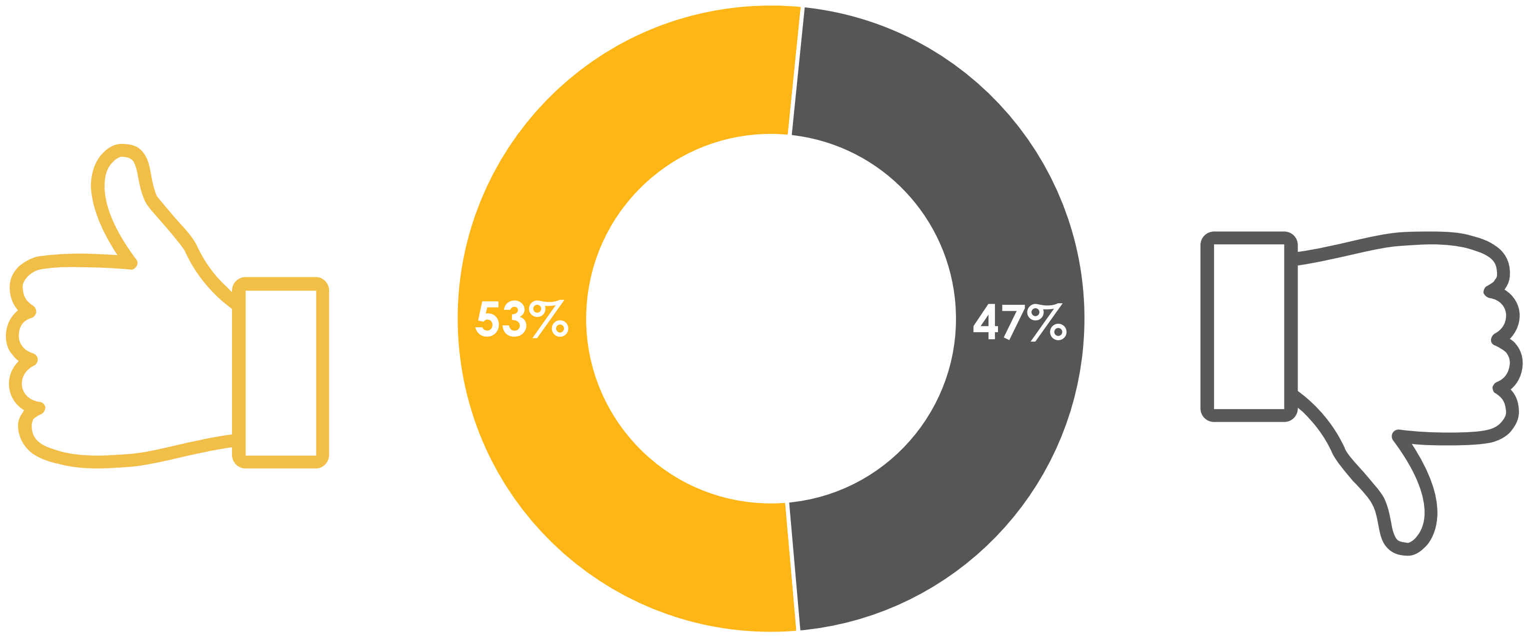
- The vast majority (93%) of customers rate managing natural gas use as being at least mildly important to their organization, including over half (53%) who indicate that it is very important.
- Legacy Union Gas customers (67% vs. 26% legacy Enbridge Gas), those who work in the agricultural industry (83% vs. 34% manufacturing), and for larger organizations (76% vs. 43% small) are among the most likely to rate managing natural gas use as being very important to their organization. Those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in the past 2 years are also far more likely to rate managing natural gas use as being very important to their organization (73% vs. 43% of those who have not).



Q6. Thinking about the natural gas that your organization uses, how important is managing the natural gas your organization consumes?
Base: Total Respondents (n=105)

Having an Active Natural Gas Strategy or Dedicated Plan

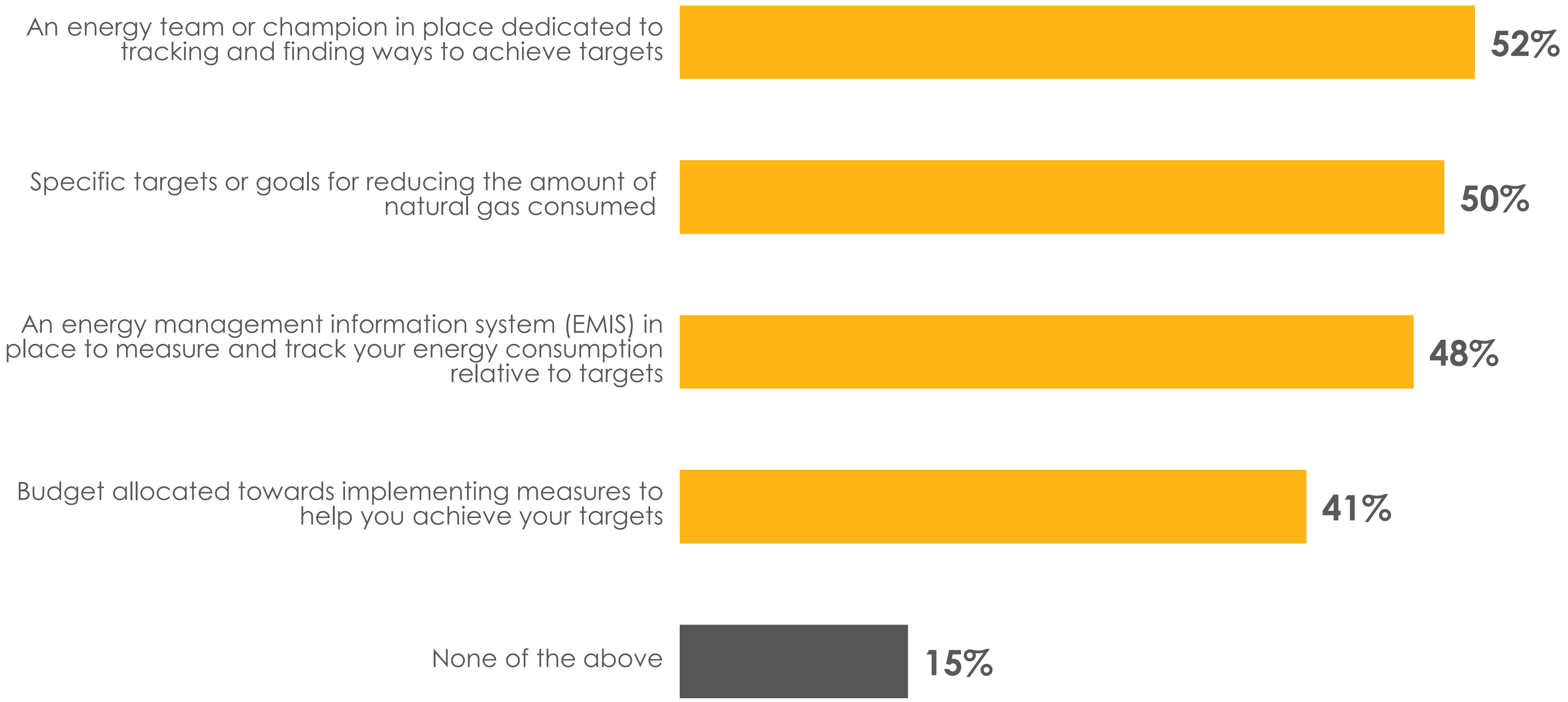
- A little over half (53%) of customers report that their organization has a strategy or dedicated plan aimed at managing the amount of natural gas they consume.
- Customers who work for large organizations (72% vs. 43% small organizations) or who have worked with Enbridge Gas to implement natural gas conservation projects (79% vs. 33% of those who have not) are among the most likely to report that their organization has a dedicated plan to manage the amount of natural gas they consume.



Q7. Does your organization have an active strategy or a dedicated plan to manage the amount of natural gas it consumes?
Base: Total Respondents (n=105)

Organizational Strategy to Manage Natural Gas Includes ….

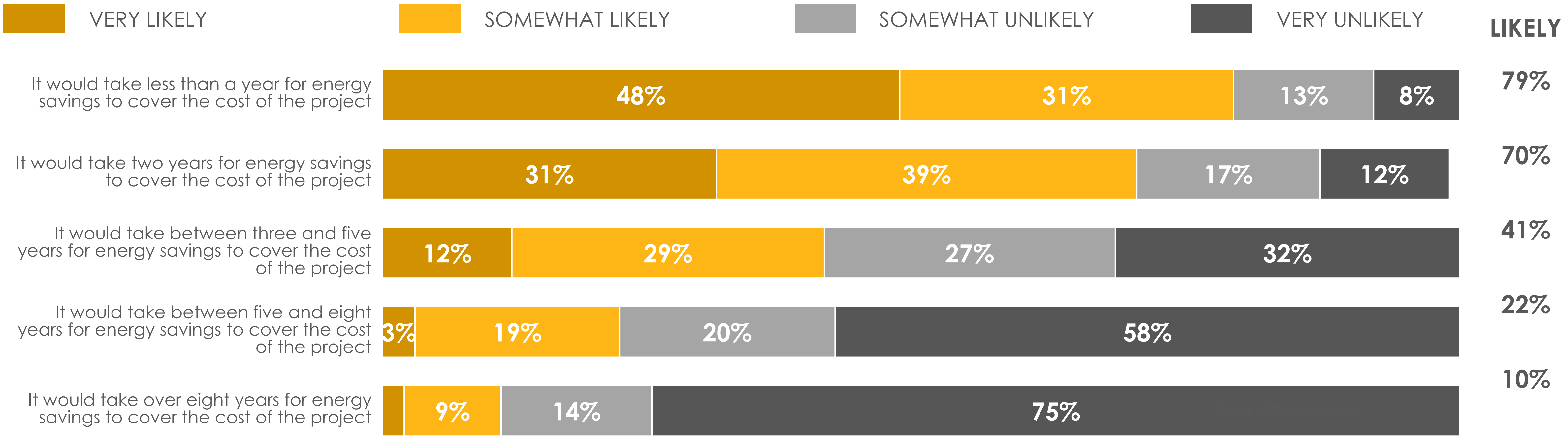
- Around half of customers claim to have an energy team or champion (52%), an EMIS (48%) or specific organizational targets for reducing natural gas consumption (50%).



Q8. Considering your organization's strategy to manage the amount of natural gas consumed, would you say you have: Select all that apply.
Base: Total Respondents (n=105)

Likelihood to Invest in Natural Gas Savings Project and Payback Period

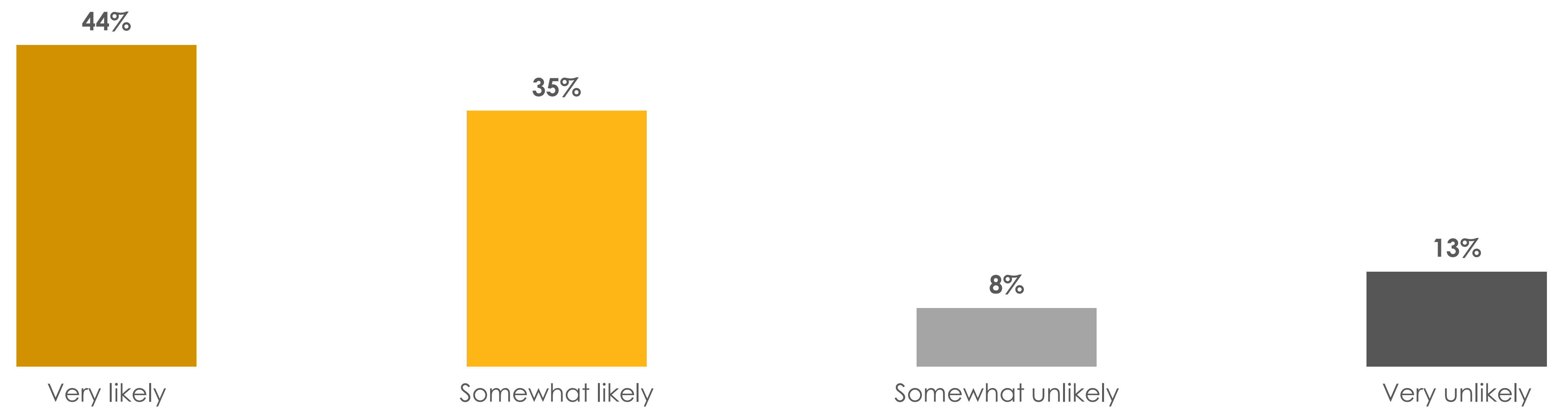
- Likelihood to invest in natural gas savings projects decreases as the time it takes for energy savings to cover the cost of the project increases.
- Those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in the past 2 years are statistically more likely to invest in natural gas saving project if the payback period is two years, or longer. Large customers are more likely than small customers to invest in natural gas savings projects, but only if the payback period is one year or less (94% vs. 72% of small customers). Legacy Union Gas customers are more likely to invest if the payback period is between five & eight years (29% vs. 9% legacy Enbridge Gas). Trade association members are more likely to invest if the payback period is two years (90% vs. 64% of non-members) or between five & eight years (39% vs. 17%).



Q9. Thinking about the natural gas your organization uses, how likely would you be to invest in a natural gas saving project if …
Base: Total Respondents (n=105)

Likelihood to Invest in Natural Gas Savings Project if Successfully Applied for a Financial Incentive

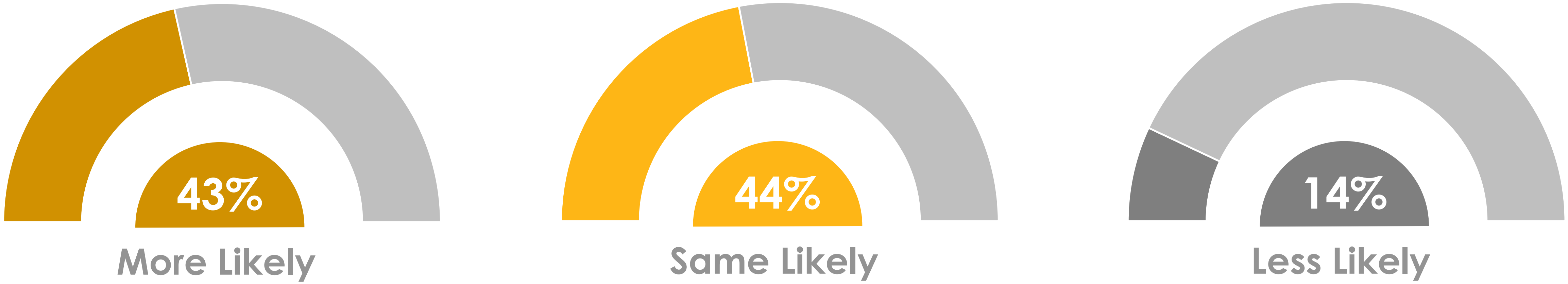
- Four in five (79%) of those who say they would be unlikely to invest in a natural gas savings project for any reason indicate that they would be likely (very/somewhat likely) to invest in a natural gas savings project if they successfully applied for a financial incentive that shortened the time period to recover the cost of the project.
- Customers who work for large organizations are more likely (at 93%) than those who work for smaller organizations (73%) to claim they would be likely to invest in a natural gas savings project if they successfully applied for a financial incentive that shortened the time period to recover the cost of the project. Those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in the past 2 years are also among the most likely to say they would do this (94% vs. 72% of those who have not).



Q10. How likely would you be to invest in a natural gas saving project if you successfully applied for a financial incentive that shortened the time period to recover the cost of the project?
Base: Any unlikely at q9 (n=96)

Likelihood to Invest in Natural Gas Savings Project if Payback Period is Validated by Utility Representative

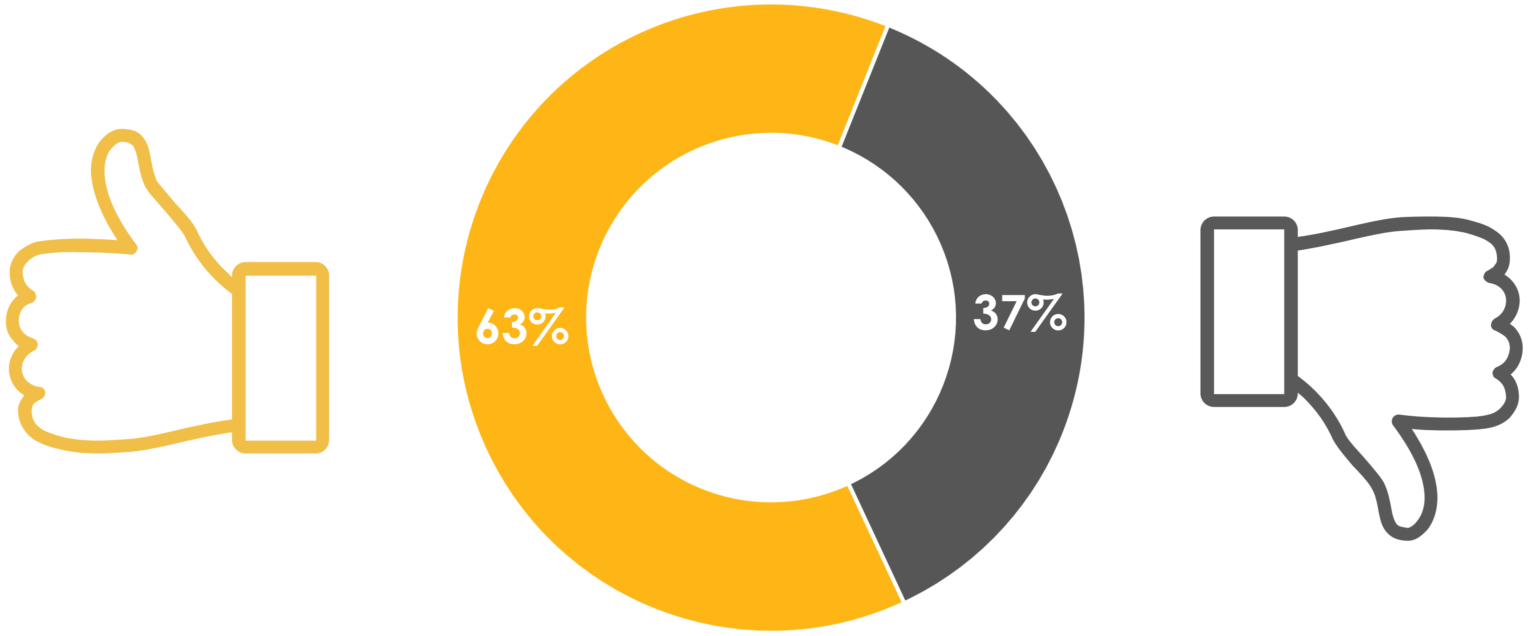
- Well over four in five (86%) customers who say they would be unlikely to invest in a natural gas savings project for any reason would be more likely (43%) or as likely (44%) to invest in a natural gas savings project if the savings and payback period was validated by a utility representative. Only fourteen percent (14%) would be less likely to do this.
- Those who have not worked with Enbridge Gas to implement natural gas conservation projects/initiatives in past 2 years are less likely to invest in a natural gas savings project if the payback period is validated by a utility representative (19% vs. 3% of those who have not).



Q11. Would you be more, the same, or less likely to invest in a natural gas saving project if the savings and payback period was validated by a utility representative?
Base: Any unlikely at q9 (n=96)

Knowing which Efficiency Upgrades to make with an Unlimited Budget

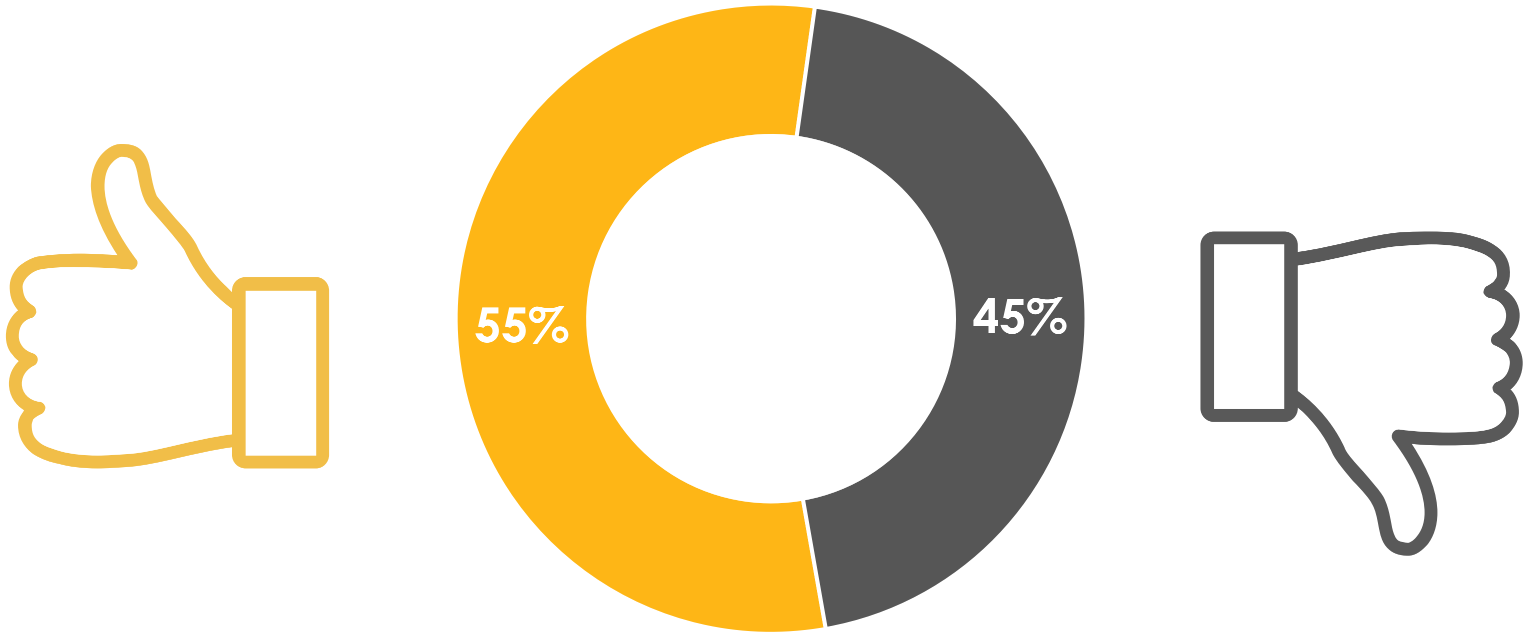
- Two-thirds (63%) of customers feel like they would know where to invest funds, if they were provided with an unlimited budget to spend towards energy efficiency upgrades to reduce their natural gas consumption.
- Legacy Union Gas customers (76% vs. 37% legacy Enbridge Gas), large customers (82% vs. 54% small), and those in the agricultural industry (86% vs. 48% manufacturing) are among the most likely to claim to know which energy efficiency upgrades to make with an unlimited budget. Those who have worked with Enbridge Gas to implement natural gas projects/initiatives in the past 2 years (83% vs. 52% of those who have not) and those who have a strategy to manage natural gas consumption (87% vs. 50% no strategy) are also more likely to think they would know which upgrades to make.



Q12. If you were provided with an unlimited budget to spend towards efficiency upgrades to reduce your natural gas consumption, would you know where to invest the funds?
Base: Total Respondents (n=105)

Ability to Estimate Savings & ROI from Upgrades

- A little over half (55%) of customers think they would be able to estimate savings and ROI associated with the energy efficiency upgrades.
- Legacy Union Gas customers are nearly twice as likely (at 66%) compared to their legacy Enbridge Gas counterparts (34%) to believe that they would be able to estimate savings & ROI. Large customers (76% vs. 46% of small customers), and those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in the past 2 years (85% vs. 36% of those who have not) are also more likely to think they would be able to estimate savings & ROI.

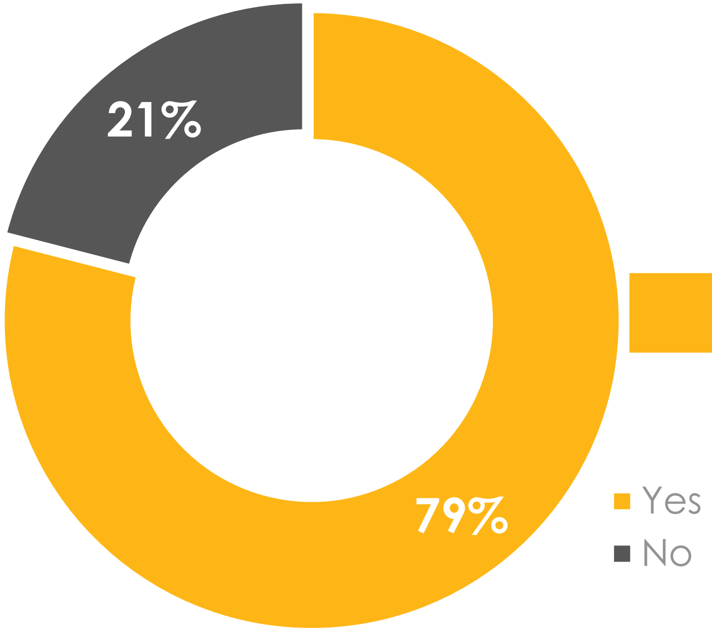


Q13. Would you be able to estimate savings and return on investment associated with the upgrades?
Base: Total Respondents (n=105)

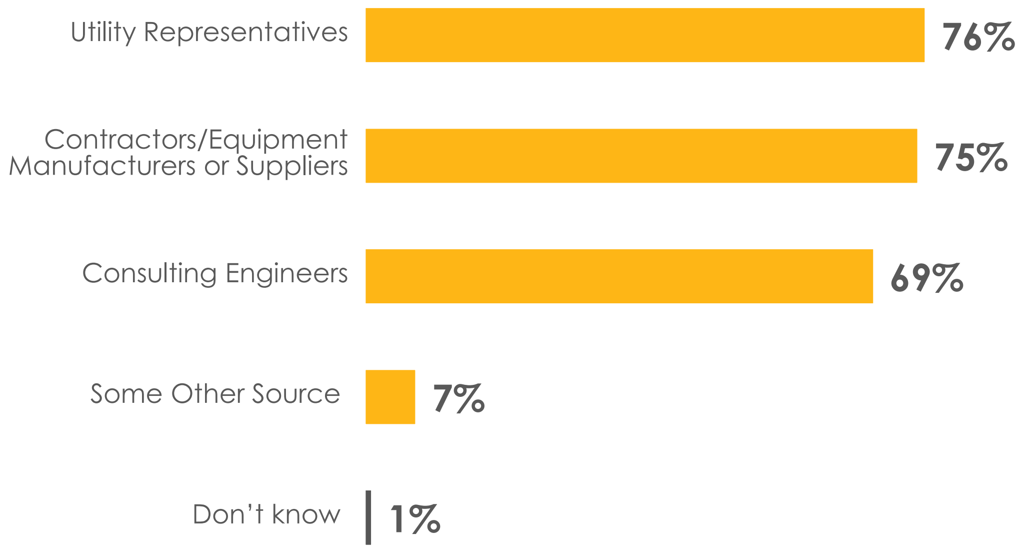
Support from External Sources

- Four in five (79%) customers would seek support from external sources to identify energy savings opportunities, most of which would go to consulting engineers (69%), contractors/equipment manufacturers (75%) or utility representatives (76%) for support.

Would Seek Support from External Sources to Identify Energy Savings Opportunities



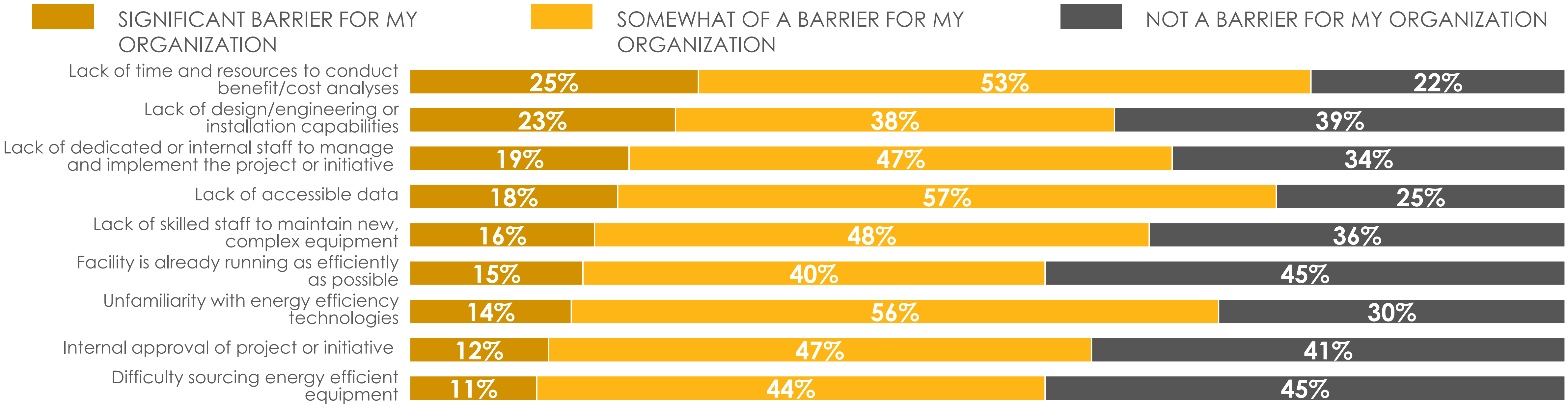
Sources Would Seek Support From



Q14. Would you seek support from external sources to help identify energy savings opportunities, estimate savings and return on investment associated with the upgrades?
Base: Total Respondents (n=105)
Q15. Who would you seek support from? (Select all that apply)
Base: Would seek support (n=83)

Barriers to Implementing Energy Conservation Projects or Initiatives

- Majorities rate all factors as posing at least somewhat of a barrier to the implementation of energy conservation projects or initiatives at their organization, with most admitting a lack of time & resources represents a considerable barrier for them (78% significant/somewhat of a barrier).
- Legacy Enbridge Gas (EGD) customers are more likely than their legacy Union Gas (UG) counterparts to cite a lack of time & resources (43% legacy EGD vs. 16% legacy UG), dedicated or internal staff (31% vs. 13%) or insufficient design/engineering or installation capabilities (40% vs. 14%) as posing significant barriers. Likewise, those who have not worked with Enbridge Gas to implement natural gas conservation projects/initiatives in the past 2 years are more likely to rate a lack of time/resources (31% vs. 10% of those who have), dedicated/internal staff (26% vs. 5%), or design/engineering/installation capabilities (34% vs. 3%) as posing significant barriers for their organization. Small customers are more likely to indicate that a lack of time/resources (31% vs. 12% of large customers) or design/engineering/installation capabilities (31% vs. 6%) are significant barriers. Those who have a strategy for reducing natural gas consumption are more likely to indicate that difficulty sourcing energy efficient equipment has been a significant barrier for them (17% vs. 3% no strategy).

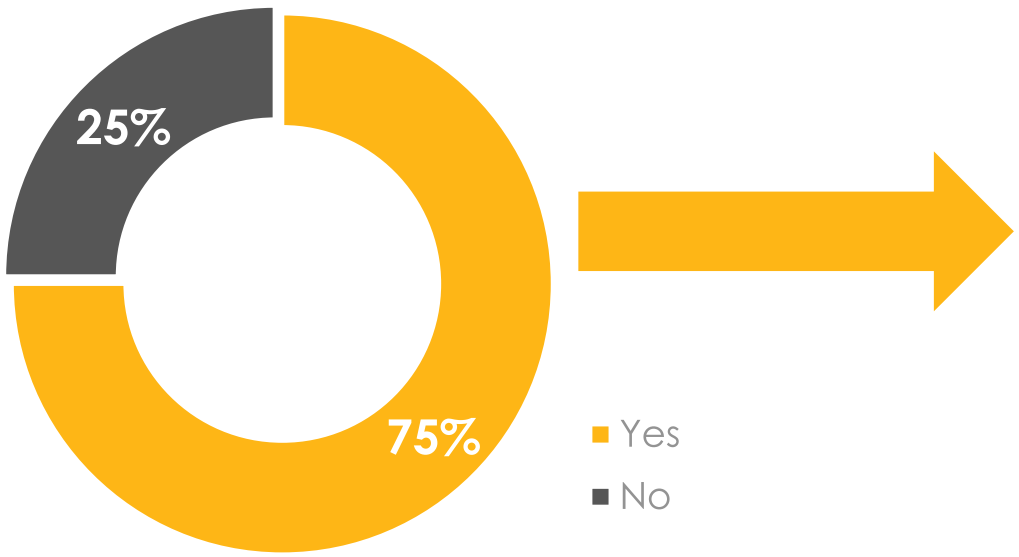


Q16. How much of a barrier would you say that each of the following are for your organization to implement energy conservation projects or initiatives?
Base: Total Respondents (n=105)

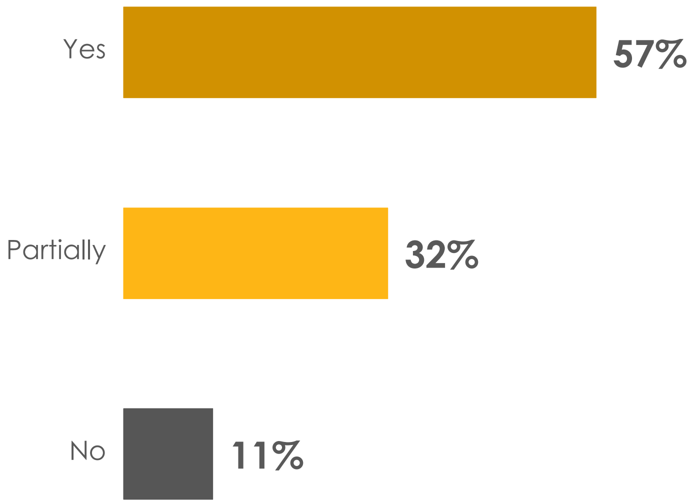
Active Maintenance Plan

- Three quarters (75%) of customers have an active maintenance plan, a majority (57%) of which claim that it is guided by regulatory and/or safety requirements.
- Groups most likely to have an active maintenance plan for natural gas equipment include: legacy Union Gas customers (83% vs. 60% of legacy Enbridge Gas customers), large customers (91% vs. 68% of small customers), those who have a strategy to reduce natural gas consumption (91% vs. 68% no strategy), and those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in the past 2 years (93% vs. 66% of those who have not).

Have Active Maintenance Plan for Natural Gas Equipment



Maintenance Plan is Guided by Regulatory/Safety Requirements

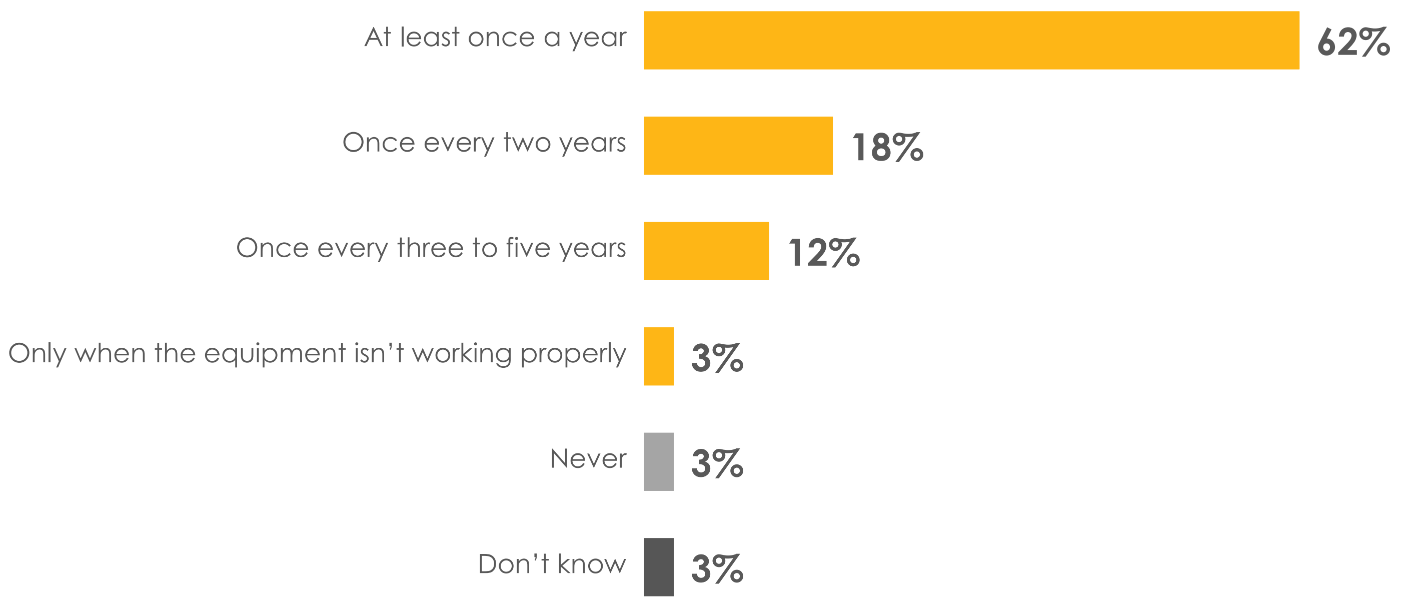


Q17. Do you have an active maintenance plan in place for your natural gas equipment?
Base: Total Respondents (n=105)
Q18. Is your maintenance plan guided by regulatory and/or safety requirements?
Base: Have a maintenance plan (n=79)

Inspection Frequency

- Nearly two-thirds (62%) of those who have an active maintenance plan that is not guided by safety and/or regulatory requirements have their natural gas equipment tested and inspected at least annually.

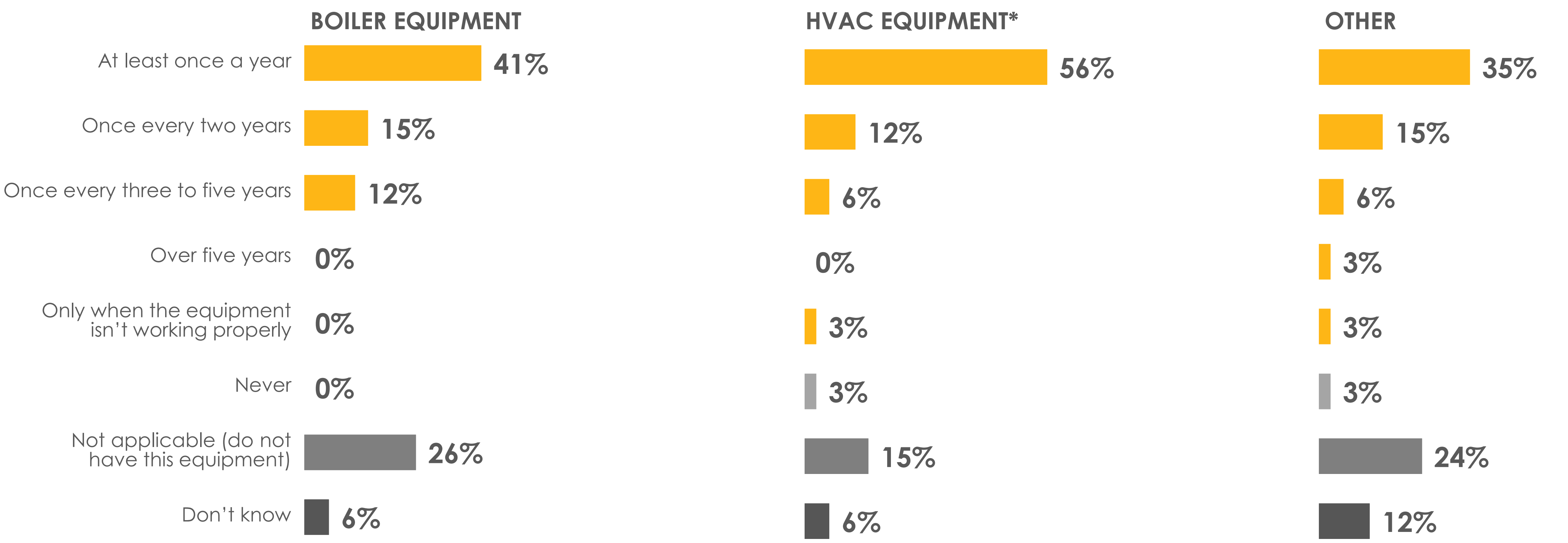
Frequency of Having Someone Inspect and Test Natural Gas Equipment to Ensure it is Operating Efficiently



QNEW19A. Regarding the maintenance plan you have in place, how frequently would you say your organization has someone inspect and test your natural gas equipment to ensure it is still operating as efficiently as possible?
Base: Have an active maintenance plan that is not guided by safety and/or regulatory requirements (n=34)

Inspection Frequency by Type of Equipment

- Inspection frequency among those who have an active maintenance plan that is not guided by safety and/or regulatory requirements varies depending on the equipment type, with majorities (56%) reporting annual inspections for HVAC equipment but less than half (41%) doing the same for boiler equipment. However, when don't know or not applicable responses are excluded, the proportion who report having their boiler equipment inspected at least once a year jumps to 56%, for HVAC equipment it rises to 66%, and for other equipment it goes from 35% to 46%.

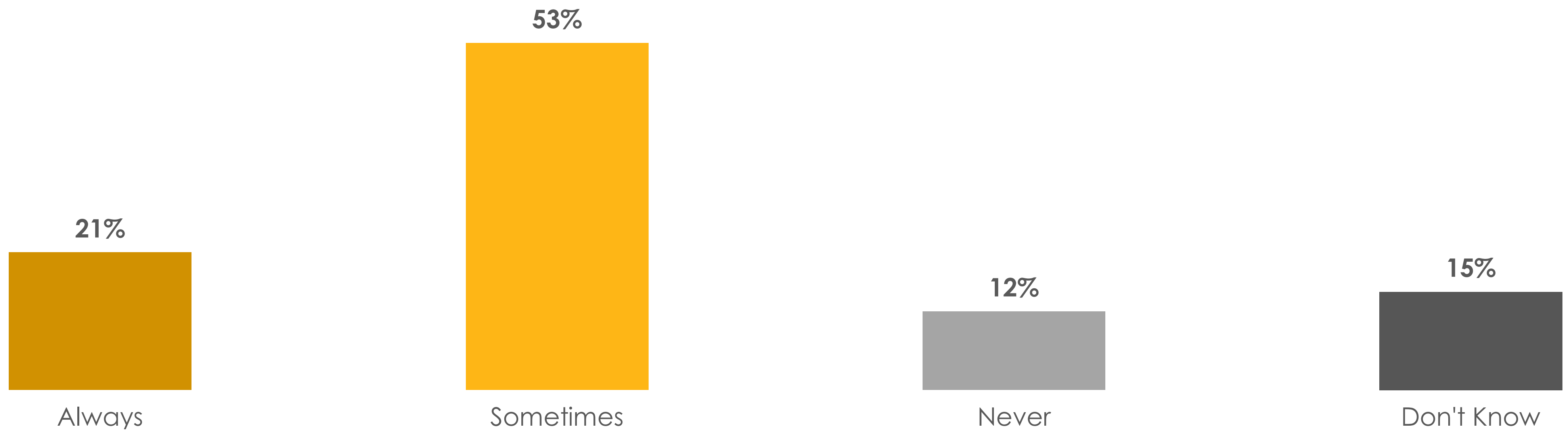


QNEW19B. Regarding the maintenance plan you have in place, how frequently would you say your organization does a tune-up on the following pieces of individual equipment?
Base: Have an active maintenance plan that is not guided by safety and/or regulatory requirements (n=34)

* (e.g. Unit Heaters, Make Up Air Units and Infrared Unit Heaters)

Frequency of Changing Equipment Operational Parameters

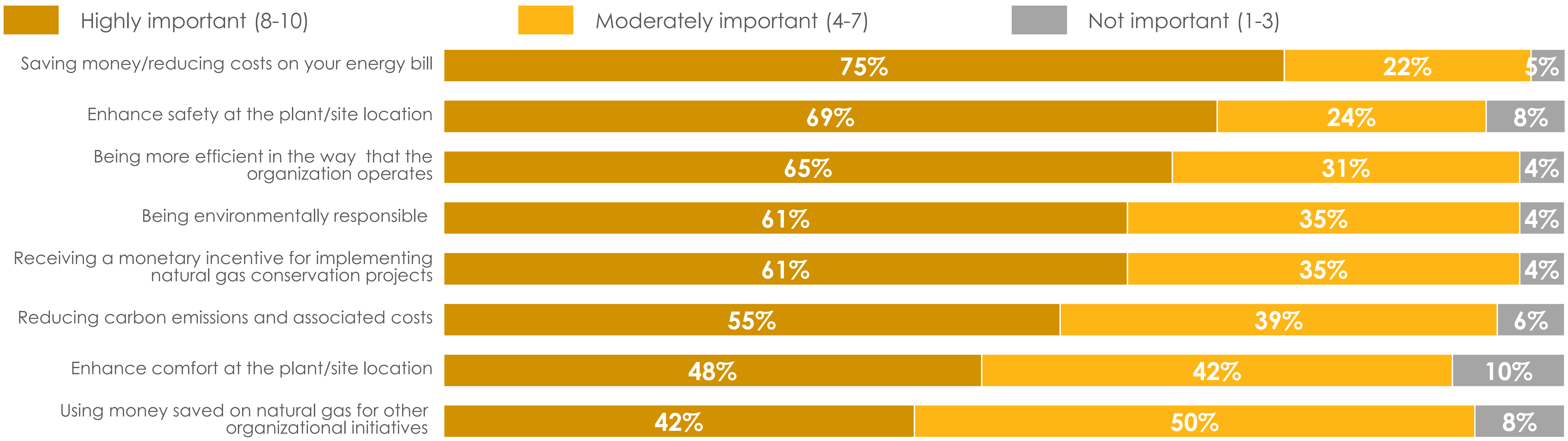
- Three quarters (74%) of those who have an active maintenance plan report that their organization makes changes to equipment operational parameters as schedules & processes evolve.



QNEW19C. Regarding the maintenance plan you have in place, how frequently would you say your organization makes changes to equipment operational parameters as your schedule and processes evolve?
Base: Have an active maintenance plan that is not guided by safety and/or regulatory requirements (n=34)

Motivators for Implementing Natural Gas Conservation Projects or Initiatives (Importance Scores)

- Saving money (75%), enhancing safety (69%), and improving efficiency (65%) rank as the top motivators for implementing natural gas conservation projects or initiatives. Enhancing comfort (48%) and using money saved on natural gas for other organizational initiatives (42%) are perceived as being less important motivators.
- Large customers are more likely (at 79%) than small customers (58%) to rate improving efficiency as being highly important (8-10 on 10-pt scale). Those who do not have a strategy for reducing natural gas consumption are more likely to list saving money on their energy bill (93% vs. 70% of those with a strategy) or using money saved on natural gas for other organizational initiatives (60% vs. 37%) as highly important motivators.

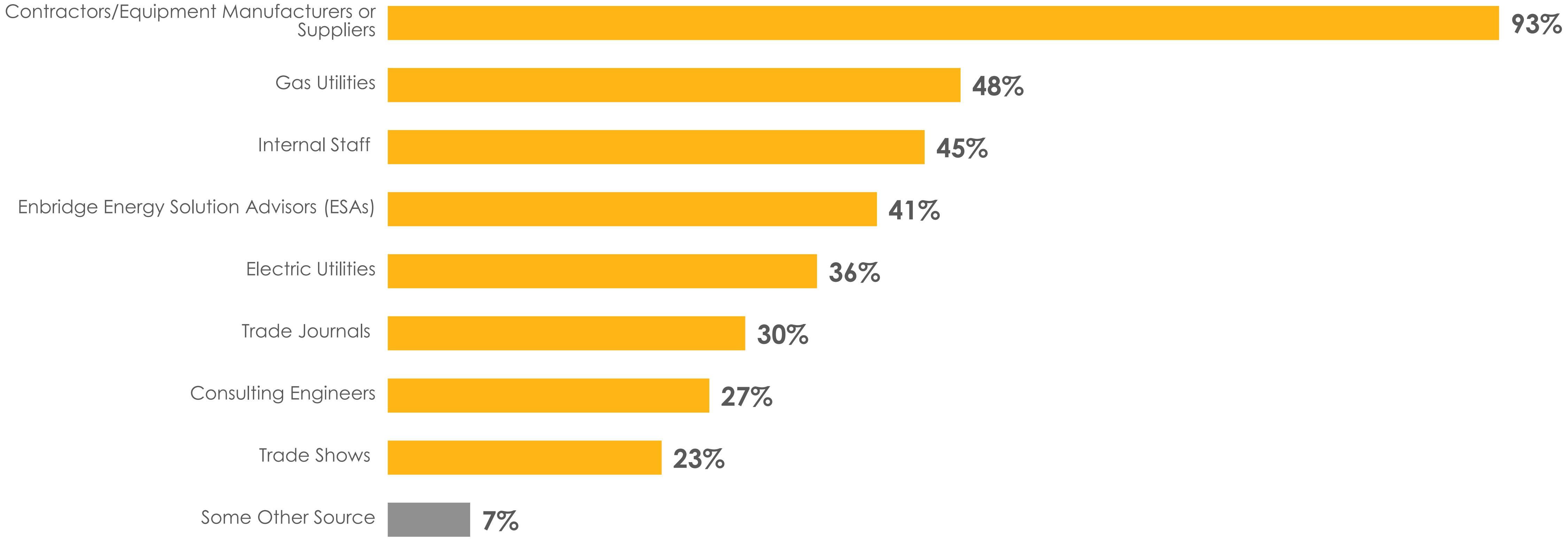


Q20. Thinking about the projects or initiatives your organization has implemented or may consider implementing in the future, please rate the importance of the following for your organization when implementing natural gas conservation projects or initiatives using a scale of 1 to 10 where 1 means not at all important and 10 means extremely important.
Base: Total Respondents (n=105)

HVAC NEEDS (Small Customers)

Partners Relied on for HVAC Purchase Decisions

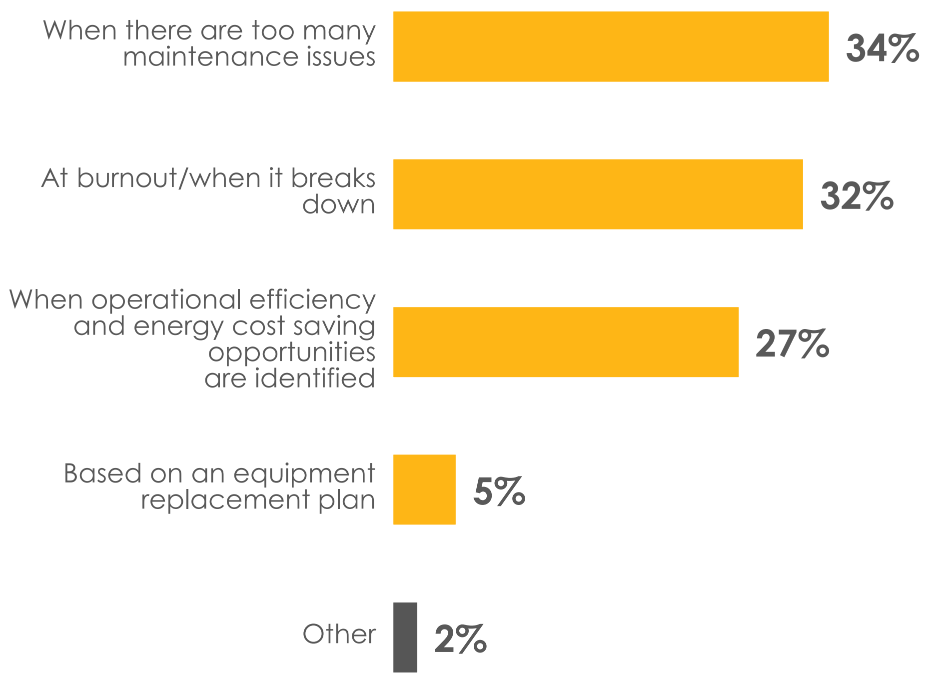
- The vast majority (93%) of small customers who own their building and use natural gas for heating or space conditioning rely on contractors, equipment manufacturers or suppliers to inform their organization's heating/cooling equipment purchase decisions.



Q21. Who do you rely on to help inform your organization's heating/cooling equipment purchase decisions? Select all that apply.
Base: Small customers who own building and use natural gas for heating or space conditioning (n=44)

Timing for Upgrading Heating/Cooling Equipment

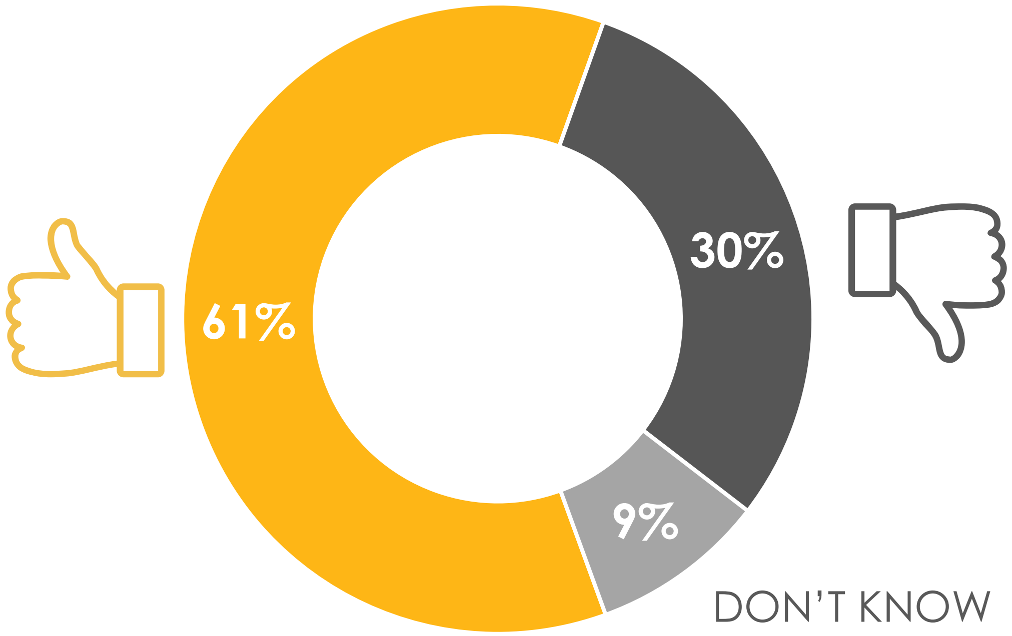
- Timing for upgrading heating/cooling equipment varies considerably among small customers who own their building and use natural gas for heating or space conditioning with around one in three waiting until they reach a point where there are too many maintenance issues (34%) or burnout/breakdown (32%) occurs. Closer to one in four (27%) would make the upgrade if operational efficiency and energy cost saving opportunities are identified. Very few (5%) have any sort of equipment replacement plan at their organization.



Q22. When would your organization be most likely to upgrade its heating/cooling equipment?
Base: Small customers who own building and use natural gas for heating or space conditioning (n=44)

Have Preferred Vendors for Equipment and Maintenance Activities

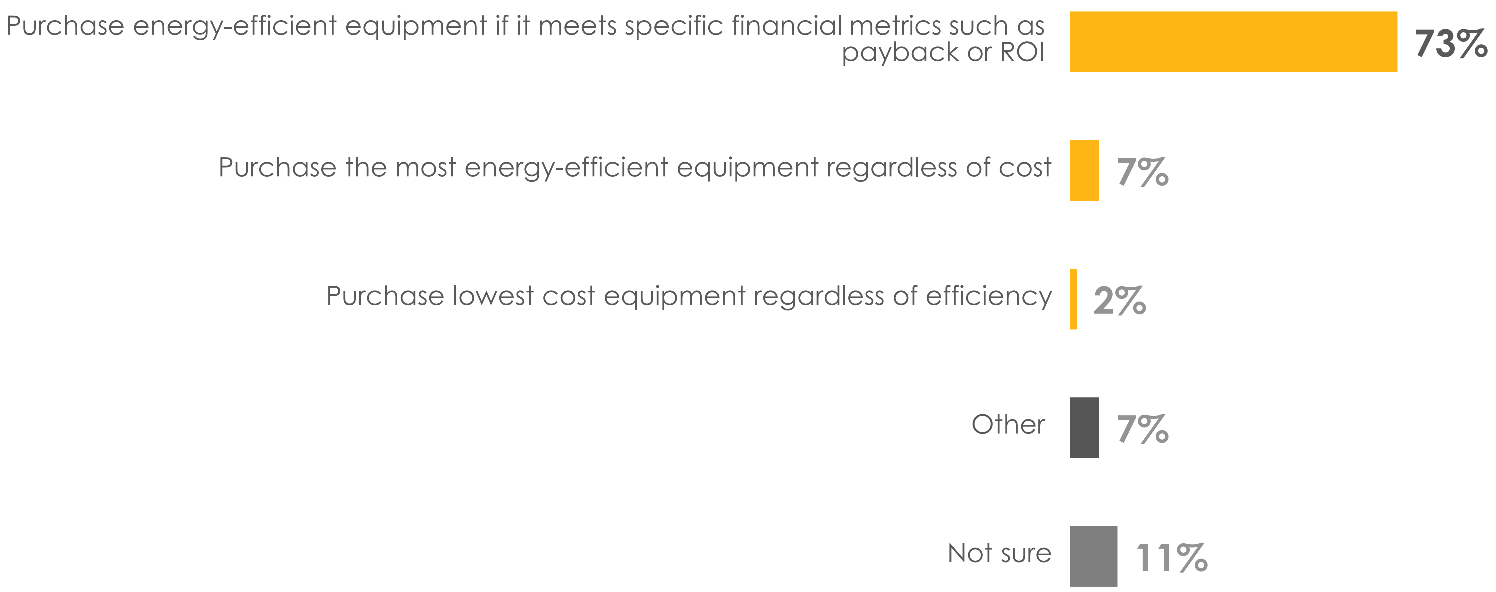
- Three-fifths (61%) of small customers who own their building and use natural gas for heating or space conditioning indicate that they have preferred vendors for equipment & maintenance activities.



Q23. Do you have any preferred vendors that you work with when investing in equipment and/or maintenance activities?
Base: Small customers who own building and use natural gas for heating or space conditioning (n=44)
Note: a follow-up question was asked of customers to understand if they would be willing to identify their preferred, but very few were willing to share this.

Approach to Deciding What Equipment to Purchase

- Most (73%) small customers who own their building and use natural gas for heating or space conditioning indicate they only purchase energy-efficient equipment if it meets specific financial metrics such as payback or ROI. Just seven percent (7%) purchase the most energy-efficient equipment regardless of cost though few (2%) purchase the lowest cost equipment regardless of efficiency.

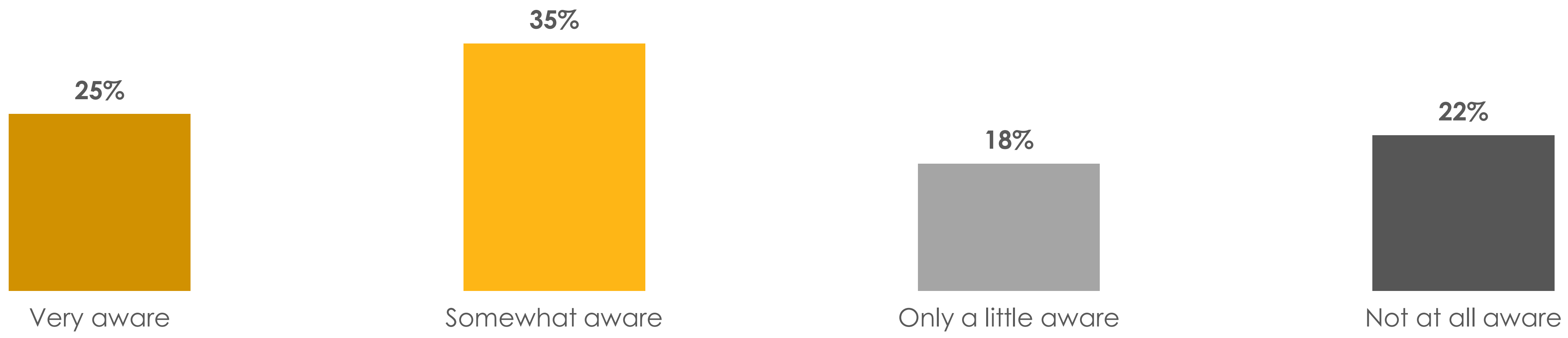


Q24. Which of the following best describes your approach to deciding what equipment to purchase?
Base: Small customers who own building and use natural gas for heating or space conditioning (n=44)

AWARENESS OF CONSERVATION OFFERINGS

Awareness of Enbridge Gas Natural Gas Conservation Offerings

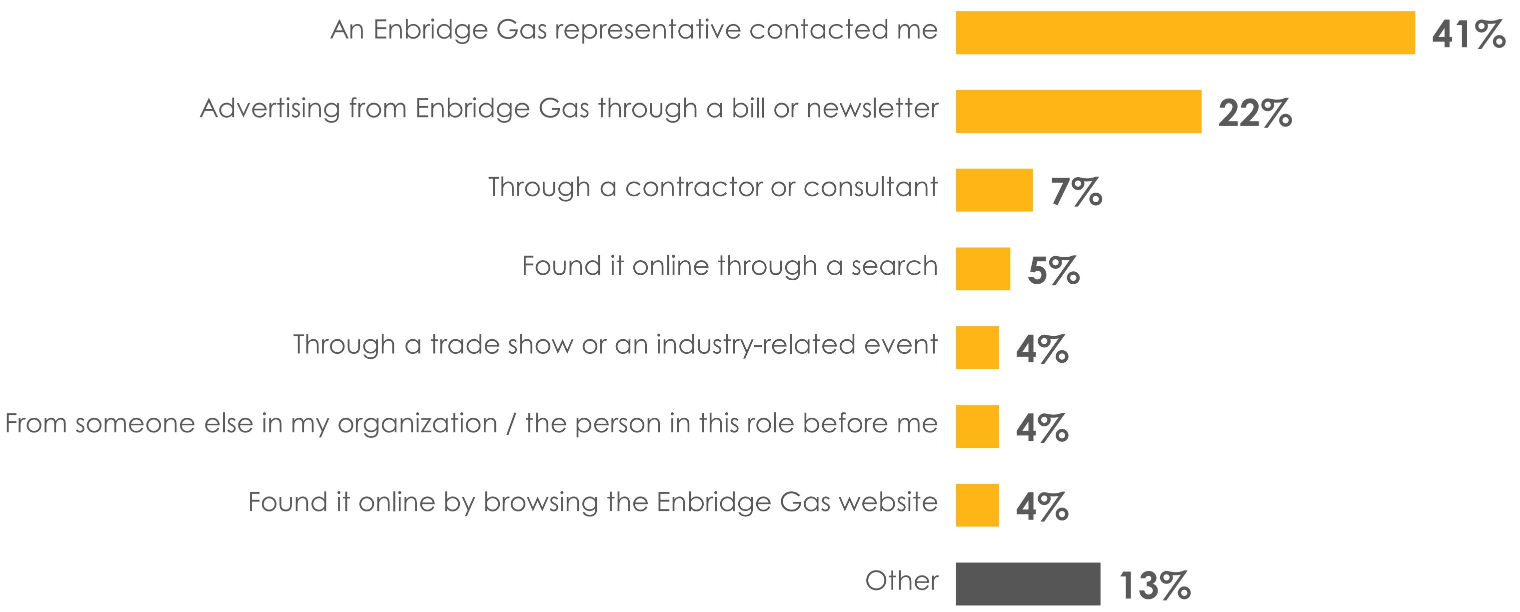
- Three in five (60%) customers are at least somewhat aware of the Enbridge Gas natural gas conservation offerings, including one in four (25%) who are very aware.
- Claimed awareness (very/somewhat aware) is highest among large customers (91% vs. 46% of small customers), legacy Union Gas customers (70% vs. 40% of legacy Enbridge Gas customers), those who have a strategy to manage natural gas consumption (83% vs. 48% no strategy) and those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in the past 2 years (93% vs. 41% of those who have not).



Q25. How aware are you that Enbridge Gas has a variety of offerings, such as technical services and financial incentives, that customers can access to support their natural gas conservation projects or initiatives?
Base: Total Respondents (n=105)

Source of Awareness of Enbridge Gas' Natural Gas Conservation Offerings

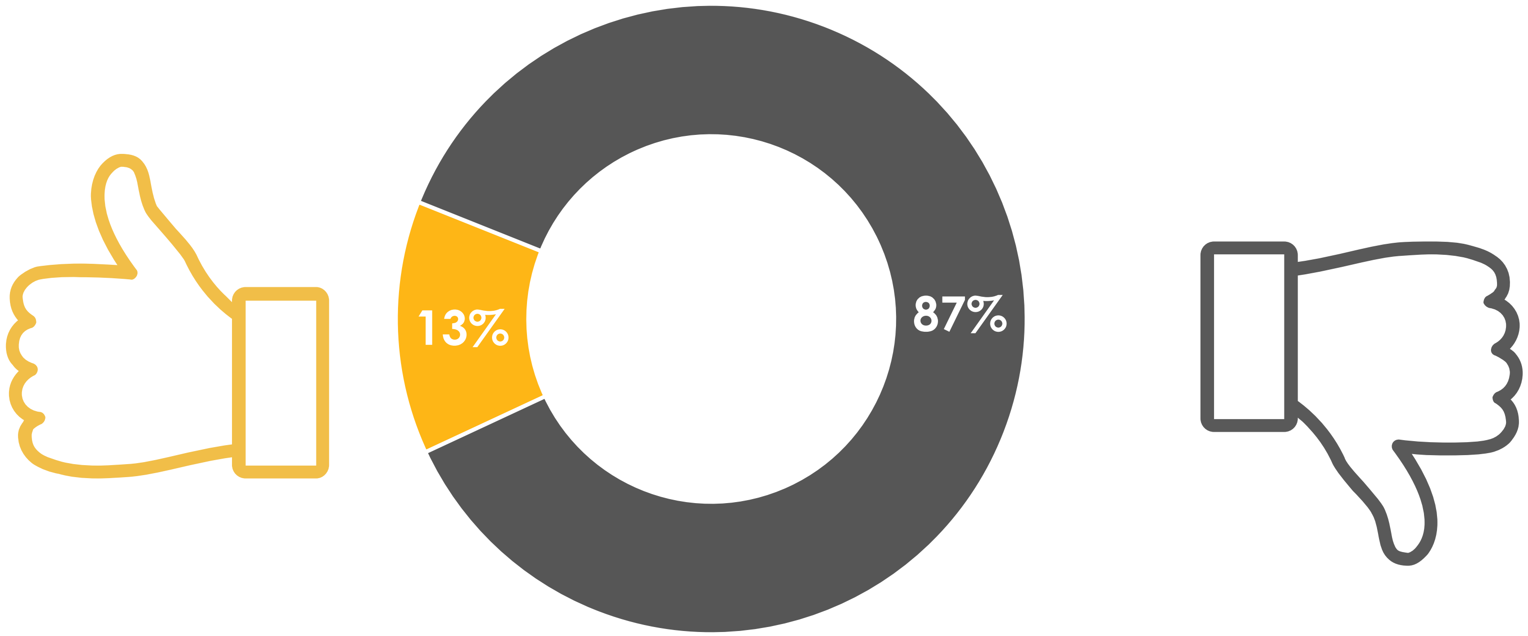
- The highest proportion of those who indicate at least minimal awareness of Enbridge Gas natural gas conservation offerings cite an Enbridge Gas representative (41%), as the source of their awareness.
- Large customers are more likely to list an Enbridge Gas representative (76% vs. 18% small) but are less likely to mention advertising from Enbridge Gas through a bill or newsletter (6% vs. 33%) or some other source (3% vs. 20%) as the origin of their awareness.
- Those who have worked with Enbridge to implement natural gas conservation projects/initiatives in the past 2 years are more likely to cite an Enbridge Gas representative (63% vs. 23% of those who have not) but are less likely to list advertising from their bill or newsletter (8% vs. 38%), online searches (0% vs. 10%) or some other source (3% vs. 20%).



Q26. How did you first learn about Enbridge Gas' natural gas conservation offerings?
Base: Aware of Enbridge Gas offerings to support natural gas conservation projects or initiatives (n=82)

Sought Information from Other Natural Gas Conservation Advisory Services

- Just thirteen percent (13%) of customers who are not at all aware of Enbridge Gas offerings have sought information from other natural gas conservation advisory services.



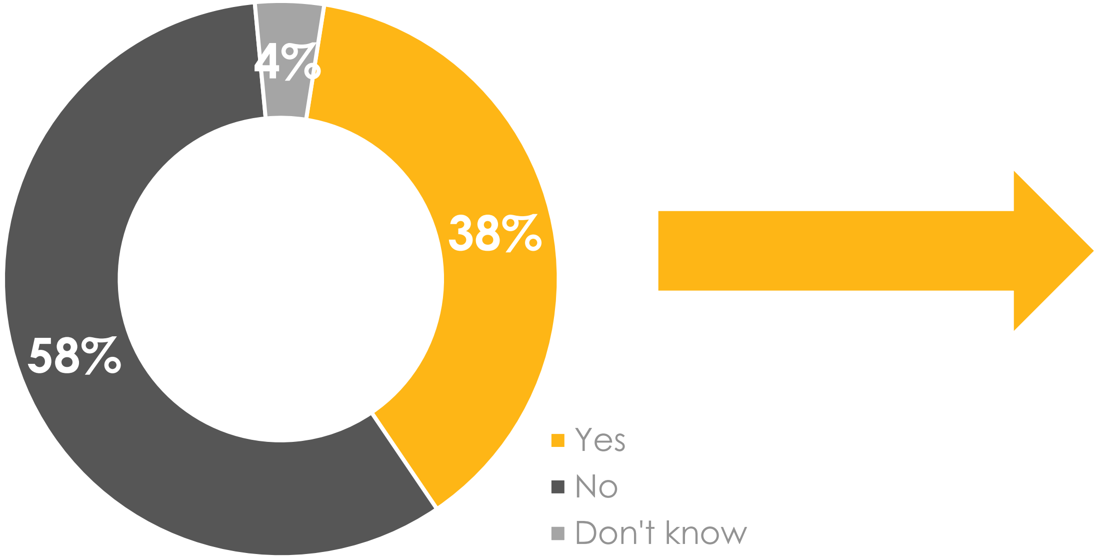
Q27. Have you ever sought out information on natural gas conservation advisory services and/or financial incentives, from any sources?
Base: Respondents Not at all Aware Enbridge Gas Offers Natural Gas Conservation Programs (n=23)
Note: a follow-up question was asked to understand who customers reached out to, but please note that the base size is too low to report results (n=3)

PARTICIPATION IN NATURAL GAS CONSERVATION OFFERINGS

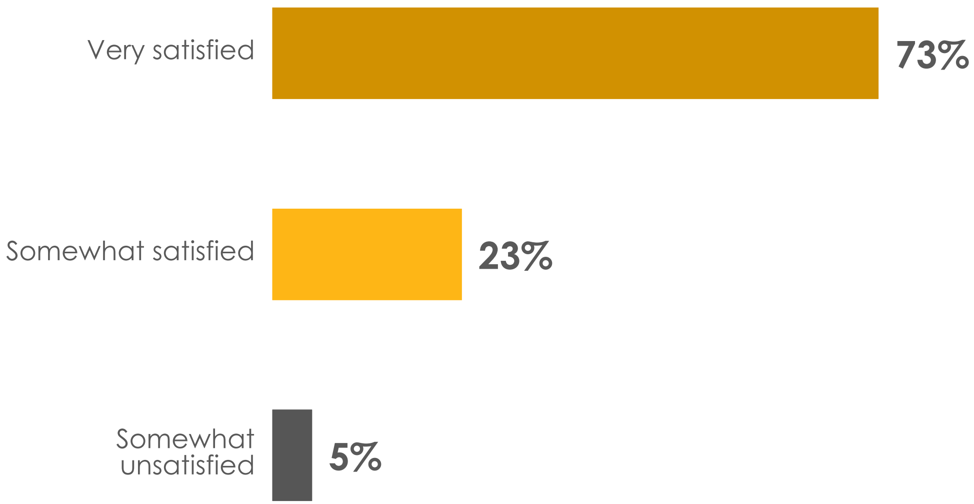
Enbridge Gas Program Participation

- Two in five (38%) customers have worked with Enbridge Gas in the past 2 years to implement natural gas conservation projects, most of which (73%) report feeling very satisfied about the experience.
- Legacy Union Gas customers (53% vs. 9% legacy Enbridge Gas customers), large customers (70% vs. 24% small), and those who have a strategy or plan to manage natural gas consumption (65% vs. 20% no strategy) are among the most likely to report that they have worked with Enbridge Gas in the past 2 years.

Worked With Enbridge Gas In the Past 2 Years



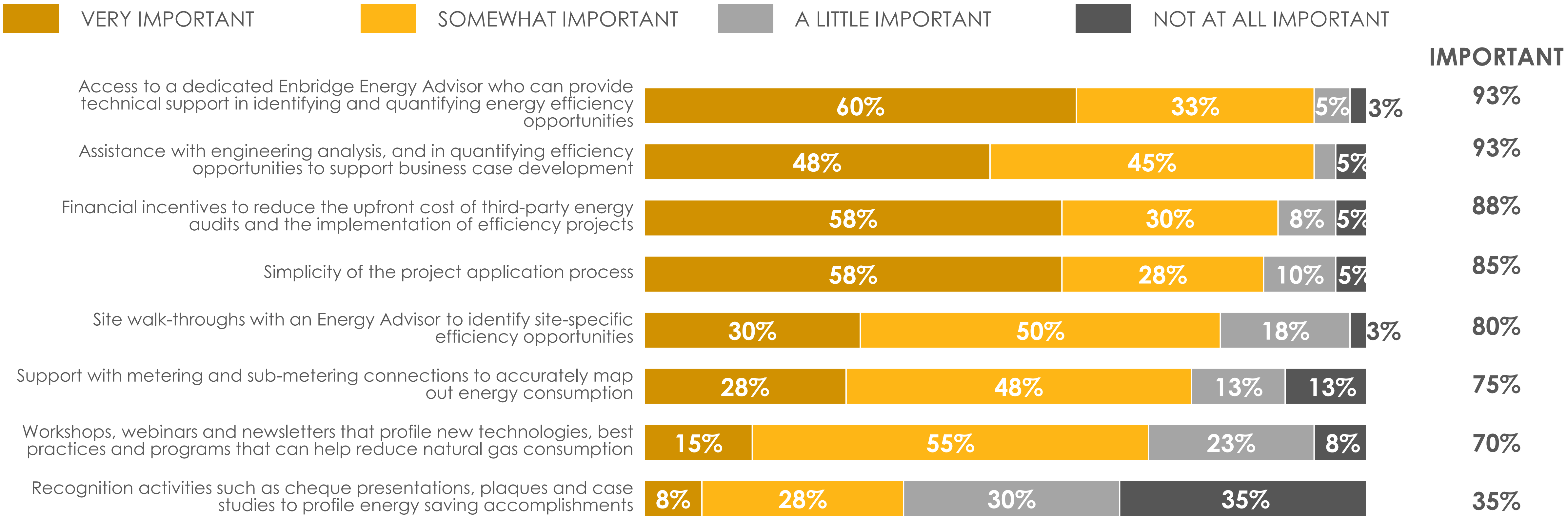
Satisfaction Working with Enbridge Gas



Q29. Has your organization worked with Enbridge Gas, in any capacity, to implement any natural gas conservation projects or initiatives in the past two years?
Base: Total Respondents (n=105)
Q30. Overall, how satisfied would you say that your organization has been with working with Enbridge Gas on these natural gas conservation projects or initiatives?
Base: Worked with Enbridge Gas to implement natural gas projects/initiatives in past 2 years (n=40)

Importance of Specific Program Offerings or Delivery Elements among those who Worked with Enbridge Gas in Past 2 Years

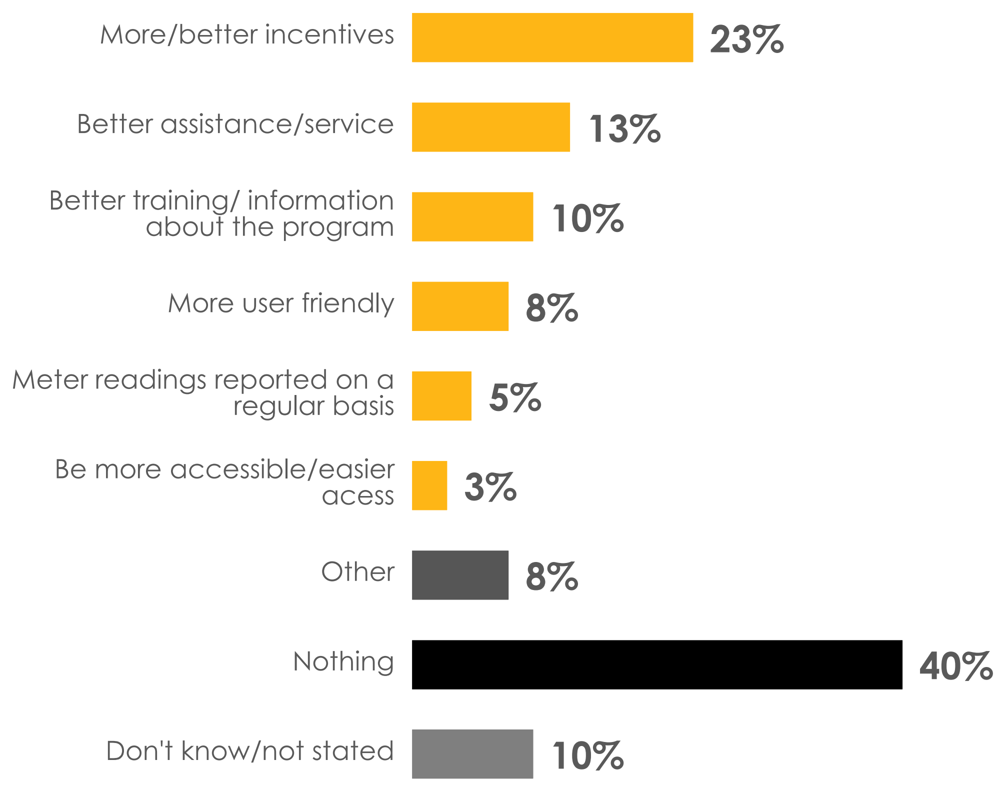
- With the exception of recognition activities (35%), most of those who have worked with Enbridge Gas in the past 2 years rate all other program offerings or delivery elements as being important to their organization. Most notably, the vast majority rate having access to a dedicated Enbridge Gas Energy Advisor (93%), assistance with engineering analysis (93%) or financial incentives (88%) as being important.



Q31. When thinking about the different elements of Enbridge Gas' natural gas conservation offering, how important are each of the following to your organization?
Base: Worked with Enbridge Gas to implement natural gas projects/initiatives in past 2 years (n=40)

Suggested Improvements for Enbridge Gas' Natural Gas Conservation Offerings (from participants)

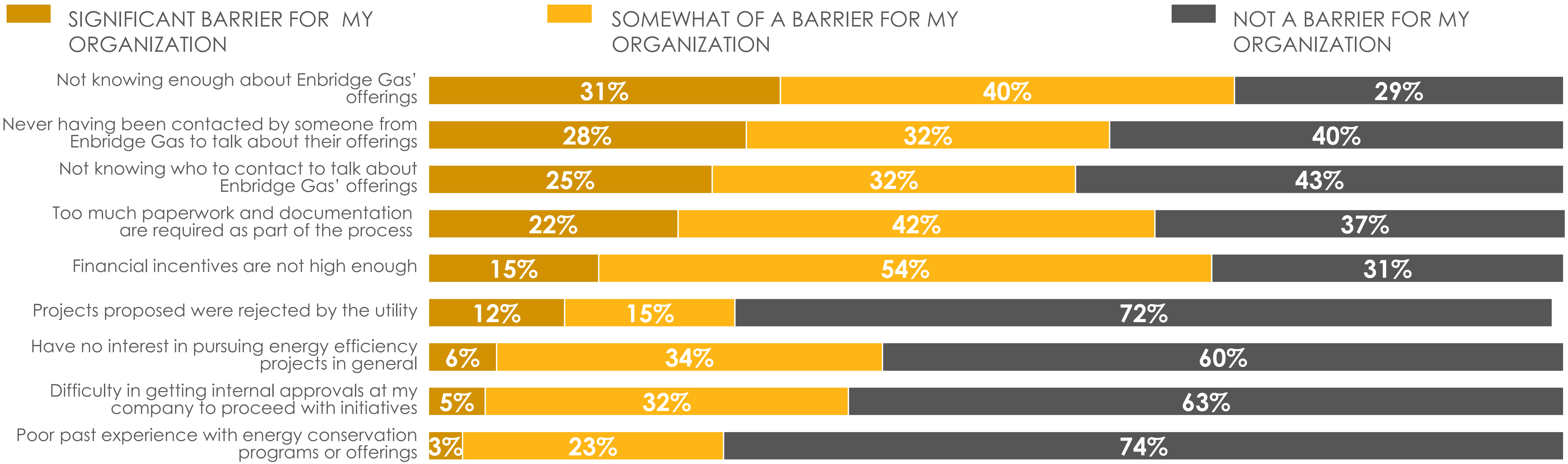
- As many as half (50%) of customers who worked with Enbridge Gas to implement natural gas projects/initiatives in the past 2 years aren't sure (10%) or don't think (40% nothing) Enbridge needs to make any improvements to it's natural gas conservation offering. However, at one in four (23%), the highest proportion of those who do offer feedback say they would like to see better incentives.



Q32. What, if any, improvements can you suggest for Enbridge Gas' natural gas conservation offerings? ________[Record Response]
Base: Worked with Enbridge Gas to implement natural gas projects/initiatives in past 2 years (n=40)

Barriers to Using Enbridge Gas' Natural Gas Conservation Offerings

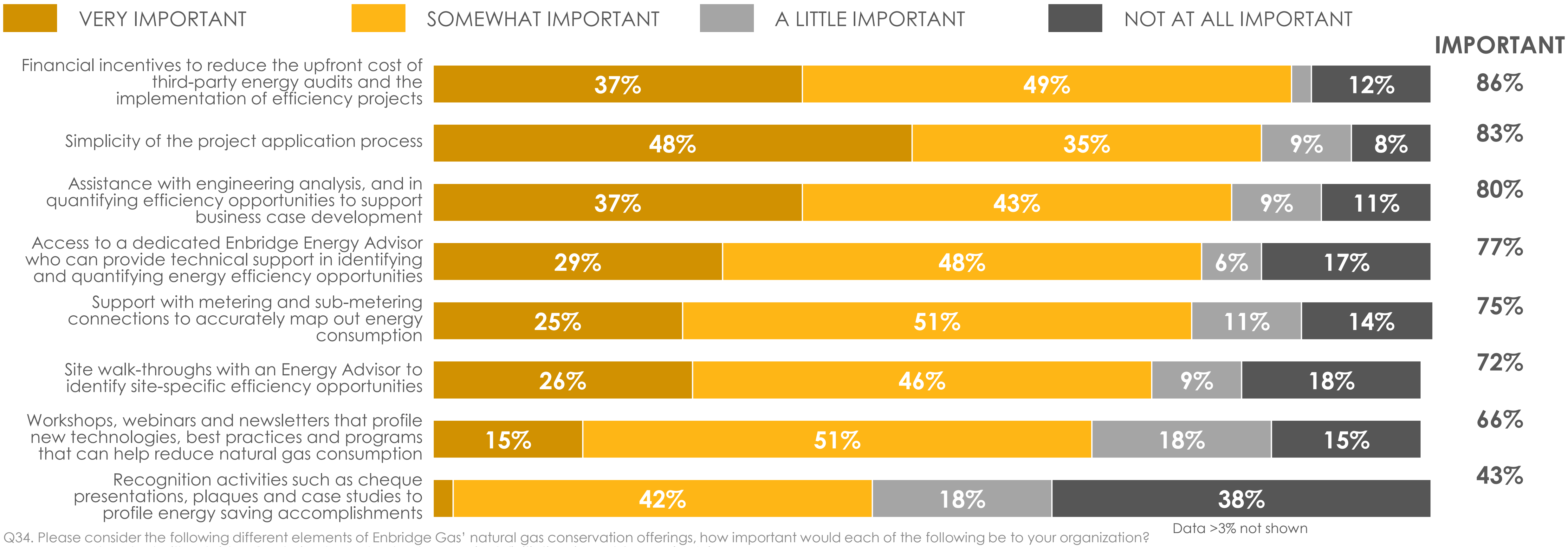
- Not knowing about Enbridge Gas' offerings (31%) and never having been contacted by someone from Enbridge Gas to talk about their offerings (28%) are most frequently cited as posing significant barriers to using Enbridge Gas' natural gas conservation offering by those who have not worked with Enbridge Gas to implement natural gas projects/initiatives in the past 2 years. Most (69%) report that a lack of financial incentives was at least somewhat of a barrier for their organization.
- Legacy Enbridge Gas customers who have not worked with Enbridge Gas are more likely to cite never having been contacted by someone from Enbridge Gas to talk about their offerings, as posing a significant barrier (41% vs. 15% of legacy Union Gas customers) for their organization.



Q33. How much of a barrier would you say that each of the following are for your organization to make use of Enbridge Gas natural gas conservation offerings.
Base: Have not worked with Enbridge Gas to implement natural gas projects/initiatives in past 2 years (n=65)

Importance of Specific Program Offerings or Delivery Elements among those who did not work with Enbridge Gas in Past 2 Years

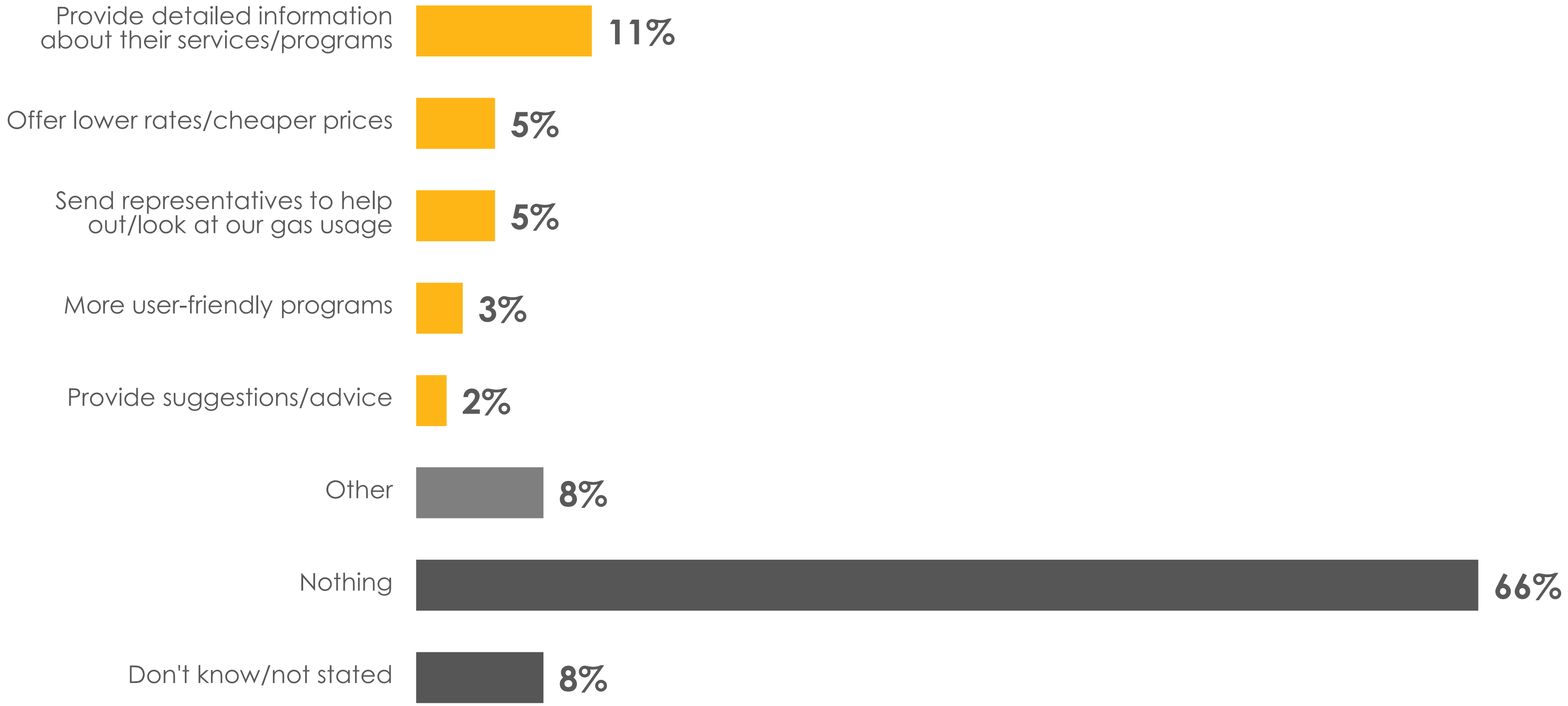
- Most of those who have not worked with Enbridge Gas to implement natural gas conservation offerings in the past 2 years think all program offerings or delivery elements are important (very/somewhat important) to their organization, save for the recognition activities.
- Legacy Enbridge Gas customers are more likely to rate site walk-throughs with an Energy Advisor (88% vs. 58% of legacy Union Gas customers) or simplistic project application processes (94% vs. 73%) as being important (very/somewhat important) to their organization.



Q34. Please consider the following different elements of Enbridge Gas' natural gas conservation offerings, how important would each of the following be to your organization?
Base: Have not worked with Enbridge Gas to implement natural gas projects/initiatives in past 2 years (n=65)

Anything Enbridge Gas Can Do to Help Support Organization in Reducing Natural Gas Consumption (from non-participants)

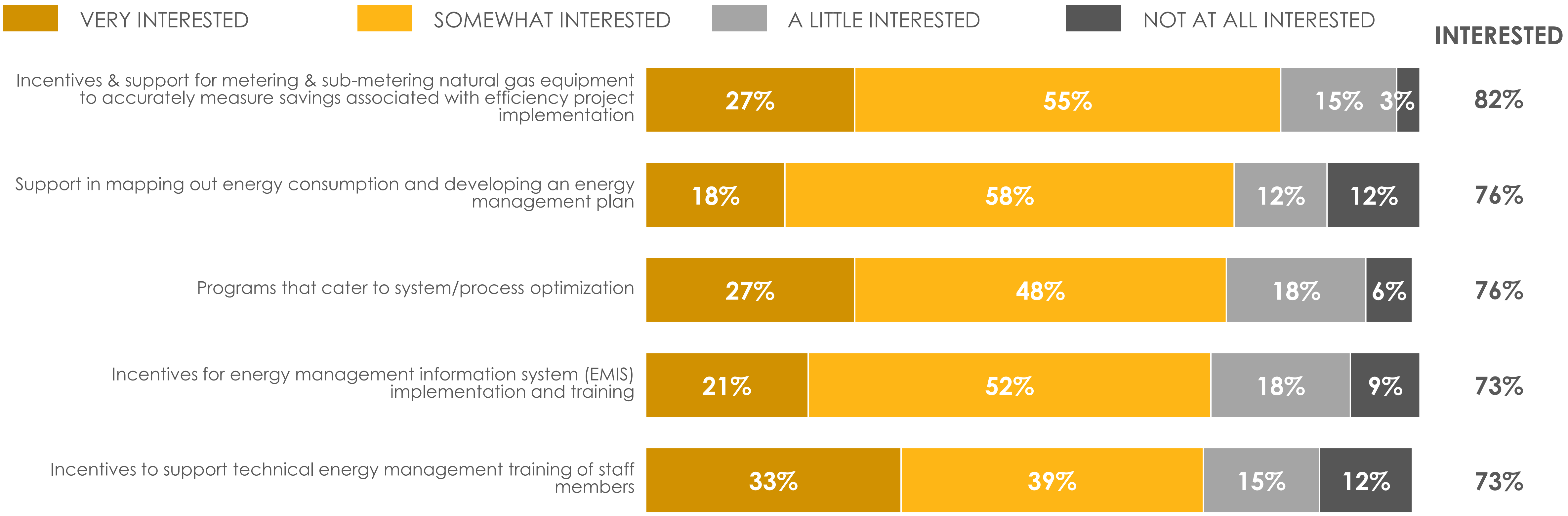
- Three quarters (74%) of customers who have not worked with Enbridge Gas to implement natural gas projects/initiatives in the past 2 years aren't sure (8%) or feel there is nothing (66%) Enbridge can do to help support their organization in reducing it's natural gas consumption. The highest proportion (11%) of those who do think something can be done cite having more detailed information about Enbridge services/programs.



Q35. Is there anything Enbridge Gas can do to help support your organization reduce its natural gas consumption? ______________
Base: Have not worked with Enbridge Gas to implement natural gas projects/initiatives in past 2 years (n=65)

Interest in Specific Program Offerings: Large Customers

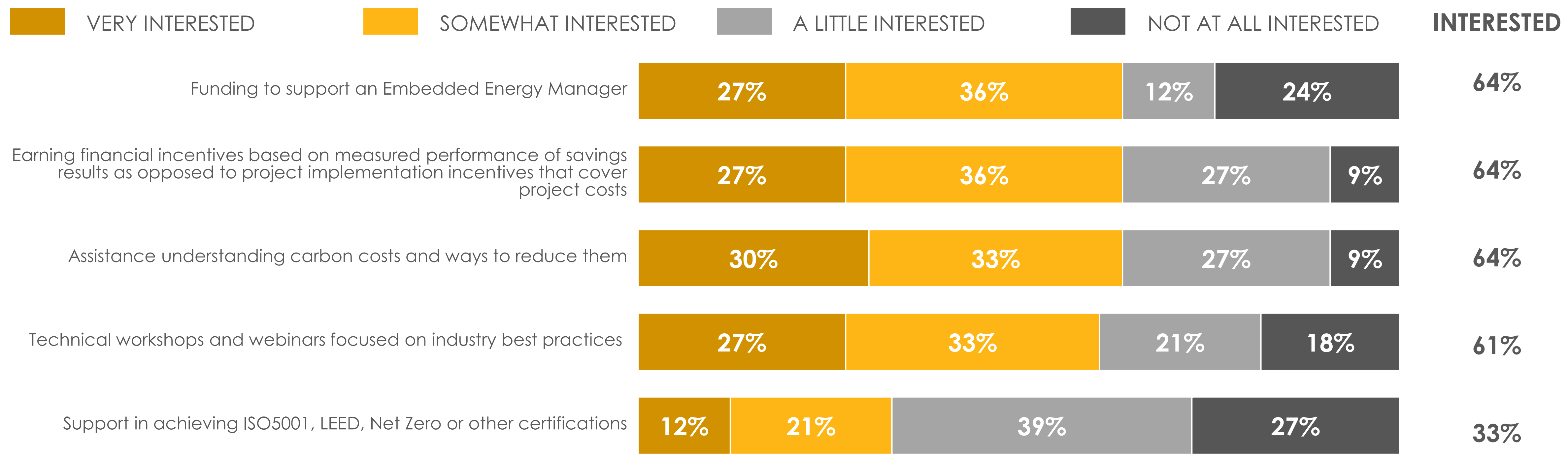
- Interest in each of the specific program offerings is high among large customers, as clear majorities indicate that they are at least somewhat interested. Most notably, over four in five (82%) express interest in having incentives & support for metering & sub-metering natural gas equipment.



Q36. How interested would your organization be in the following tools and resources in order to better manage and reduce the amount of natural gas consumed? How about…
Base: Large customers (n=33)

Interest in Specific Program Offerings: Large Customers (Cont'd)

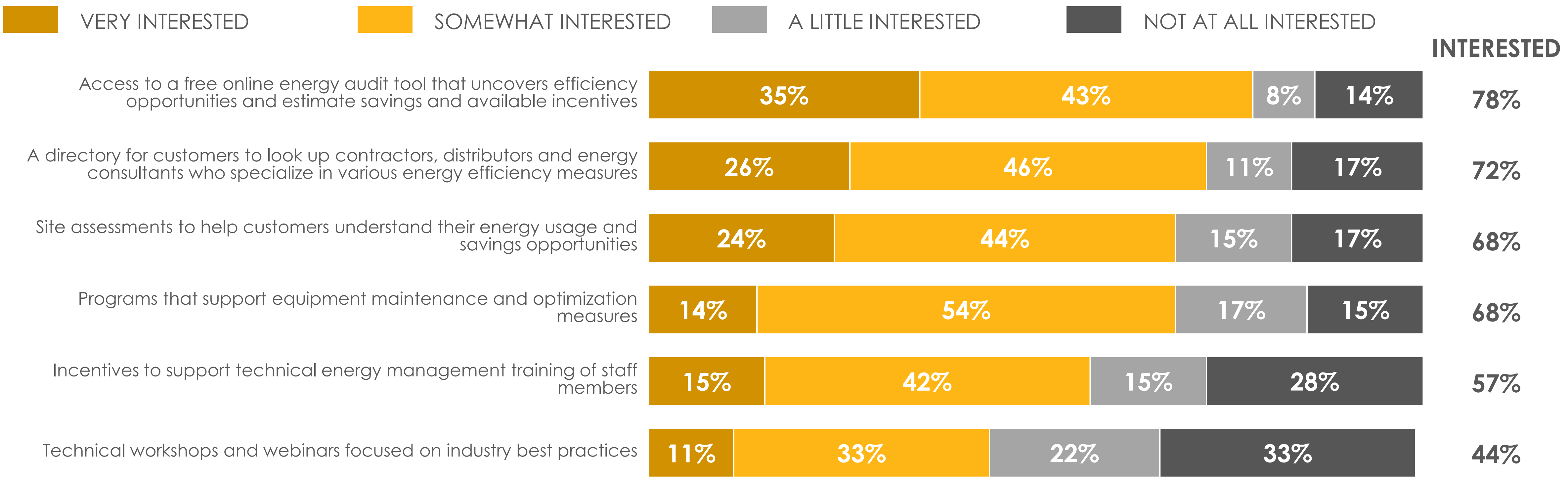
- Two in three large customers express interest (very/somewhat interested) in funding to support an Embedded Energy manager (64%), financial incentives based on measured performance (64%), or assistance understanding carbon costs (64%). Closer to three in five (61%) are interested in technical workshops and webinars focused on industry best practices. Just one-third (33%) are interested in having support in achieving certifications such as ISO5001, LEED, or Net Zero.



Q36. How interested would your organization be in the following tools and resources in order to better manage and reduce the amount of natural gas consumed? How about…
Base: Large customers (n=33)

Interest in Specific Program Offerings: Small Customers

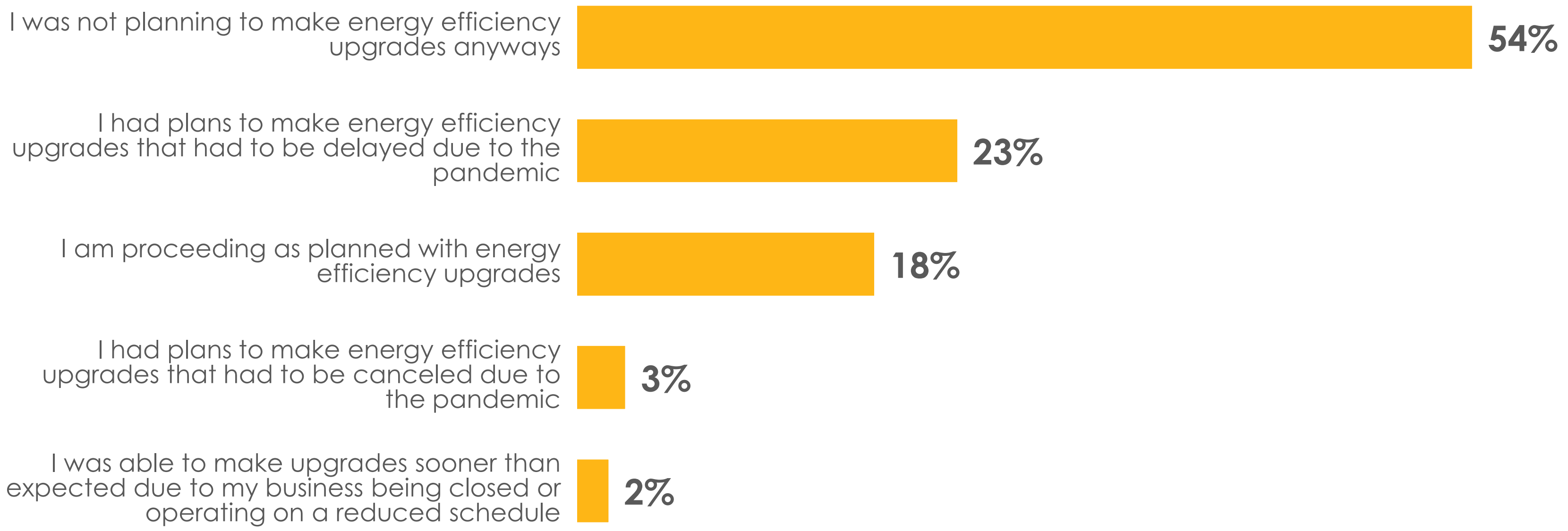
- Solid majorities of small customers express interest in each of the specific program offerings, save for technical workshops and webinars focused on industry best practices (44% very/somewhat interested).



Q36. How interested would your organization be in the following tools and resources in order to better manage and reduce the amount of natural gas consumed? How about…
Base: Small customers (n=72)

Impact of COVID-19 on Intent to Make Upgrades

- As many as one in four (23%) customers claim that the pandemic has delayed their plans to make energy efficiency upgrades and three percent (3%) had to cancel their plans completely.
- Large customers (42% vs. 14% of small customers), those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in past 2 years (43% vs. 11% of those who have not), those with a strategy to reduce natural gas consumption (37% vs. 15% no strategy) and trade association members (35% vs. 14% of non-members) are more likely to report having delayed upgrades due to COVID-19. Legacy Enbridge gas customers (71% vs. 46% of legacy Union Gas customers), small customers (63% vs. 36% of large customers), non-trade association members (64% vs. 39% of members), and those who have not worked with Enbridge Gas to implement natural gas conservation projects/initiatives in past 2 years (70% vs. 30% of those who have) are more likely to admit that they weren't planning to make any upgrades, anyways.

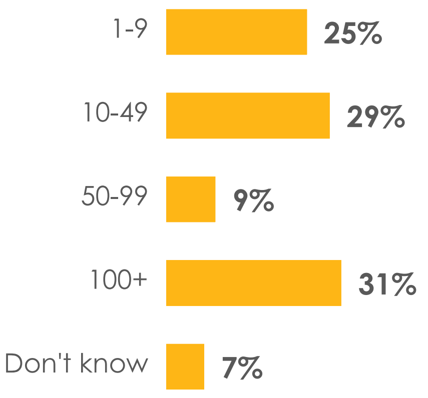


Q37. Has the COVID-19 pandemic impacted your intent to adopt energy efficient upgrades and practices in the near term? Please select the statement that most closely matches your current situation.
Base: Total Respondents (n=105)

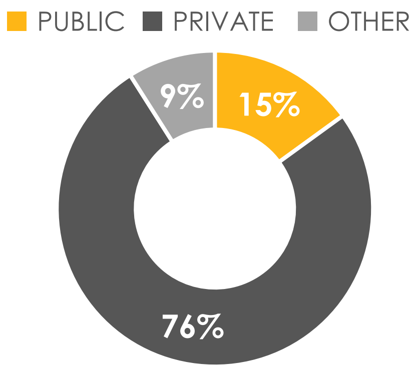
FIRMOGRAPHICS

Firmographics

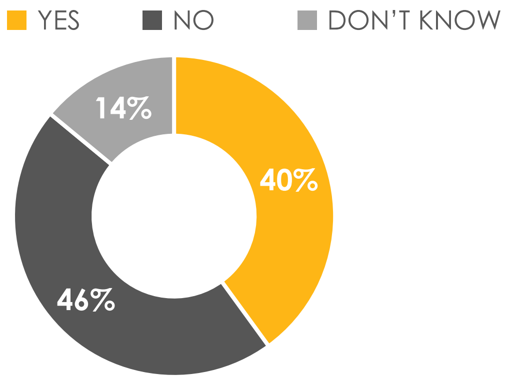
EMPLOYEES (2019)



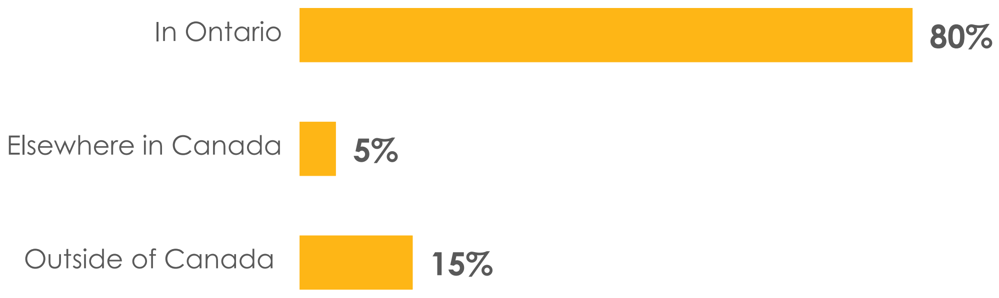
OWNERSHIP STRUCTURE OF ORGANIZATION



ORGANIZATION IS MEMBER OF ANY TRADE ASSOCIATIONS

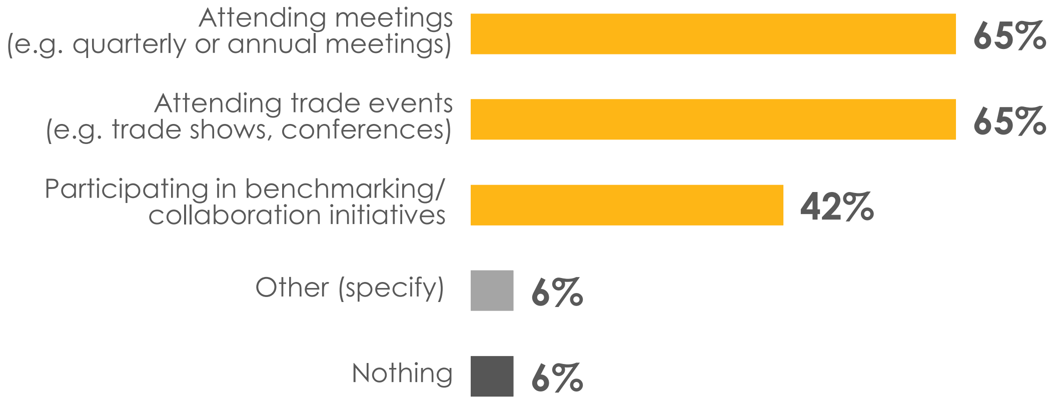


HIGHEST-LEVEL DECISION-MAKING FOR ORGANIZATION IS IN….

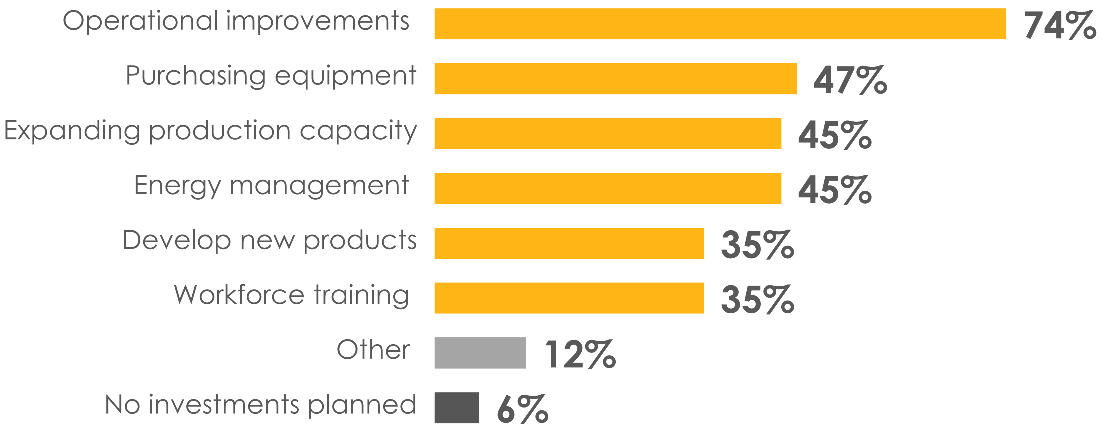


Firmographics (Cont'd)

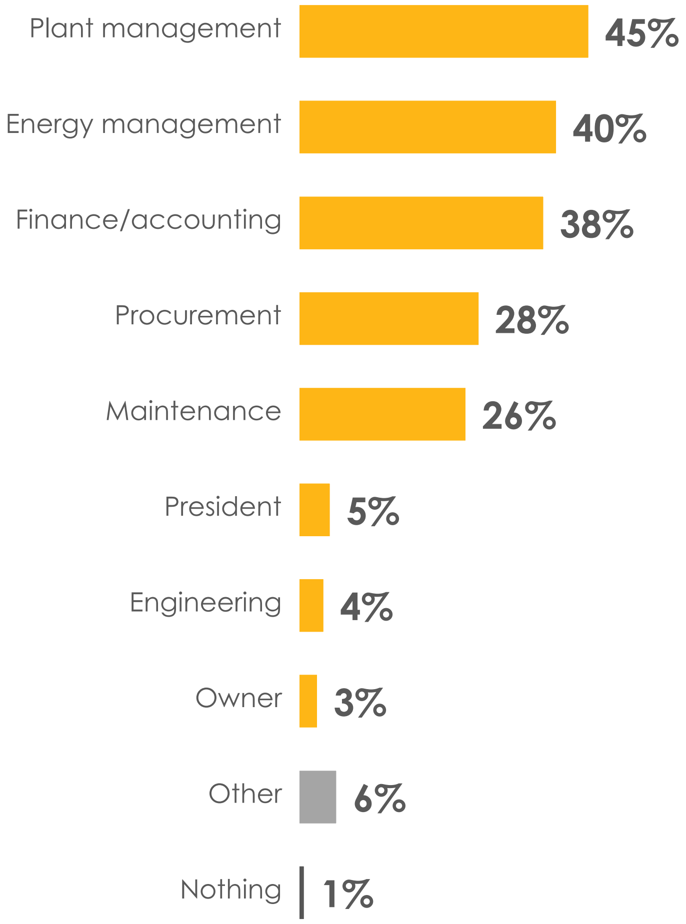
ACTIVITIES ACTIVELY PARTICIPATE IN



ORGANIZATIONAL INVESTMENT PRIORITIES NEXT 5 YEARS

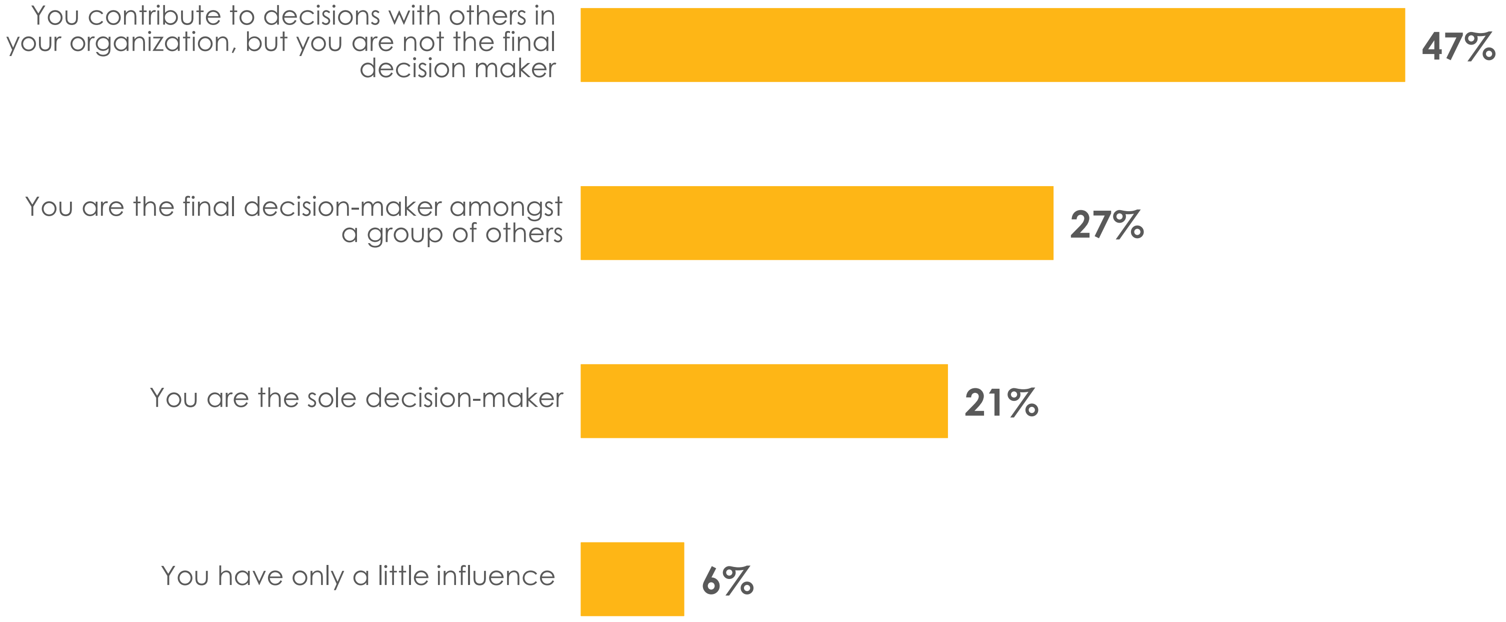


ROLE IN ORGANIZATION



Organizational Role of Respondents

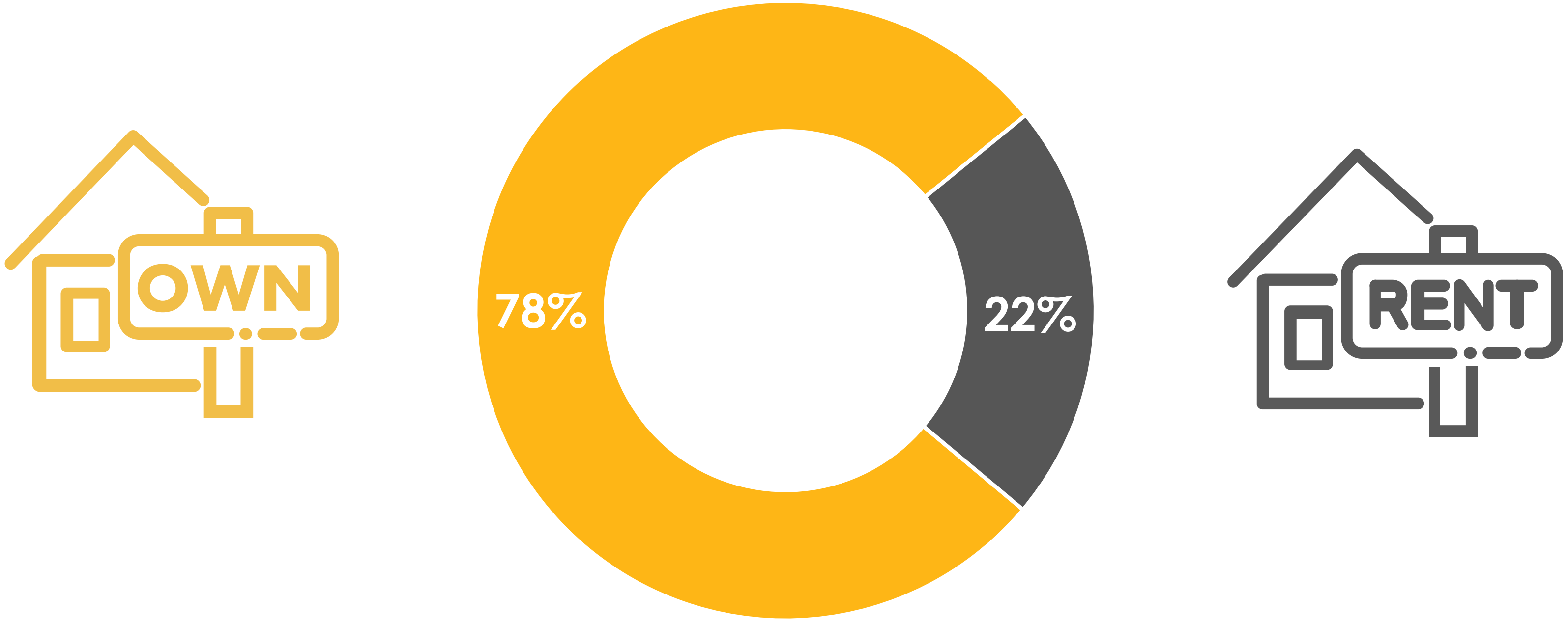
- Virtually all (94%) customers report having at least a moderate amount of influence when it comes to decision-making at their organization, though a majority (52%) indicate they are not the final decision-maker.
- Customers who work for larger organizations are less likely to report being sole decision-makers (0% vs. 31% of small customers) and are more likely to be contributors to decisions with others in their organization (70% vs. 36%). Similarly, those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in past 2 years are more likely to be contributors (60% vs. 39% of those who have not) and are less likely to be sole decision-makers (10% vs. 28%). Those who work for an organization with a strategy to reduce natural gas consumption are more likely to be contributors (59% vs. 35% no strategy).



Q1. Which of the following statements best describes your role with regards to making decisions about managing natural gas consumption or costs for your organization? Would you say…
Base: Total Respondents (n=105)

Building Ownership

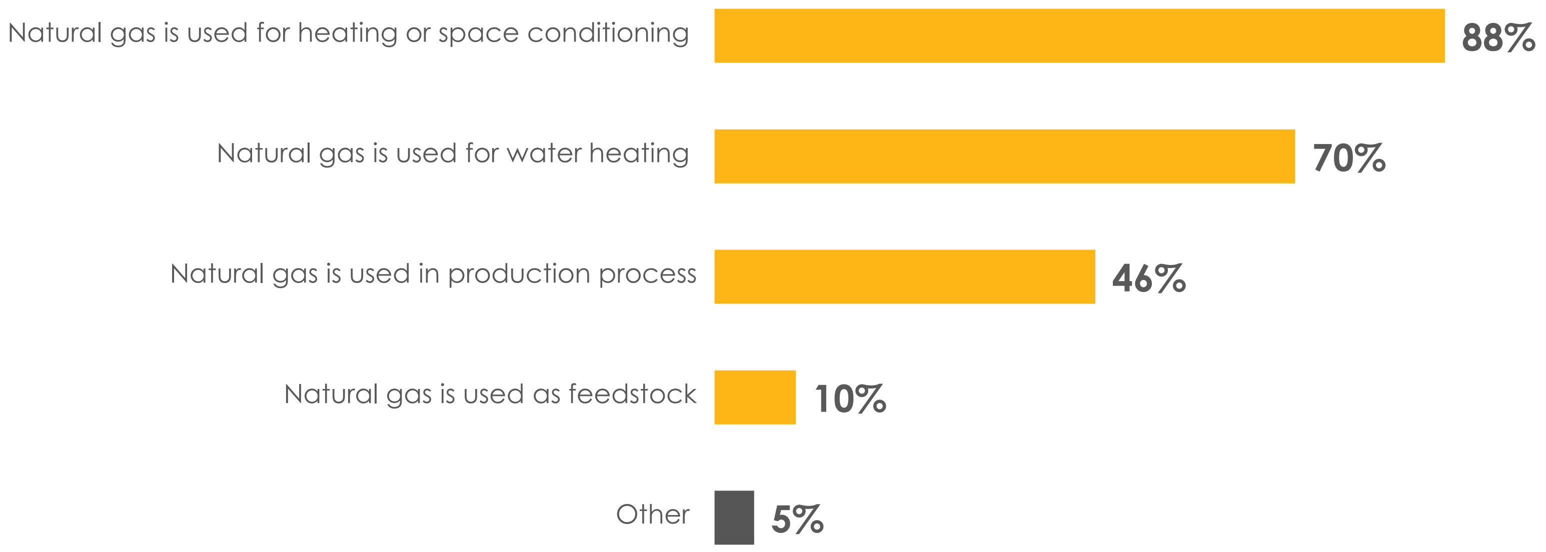
- Just over three quarters (78%) of customers report ownership of the building(s) where their organization conducts business.
- Legacy Union Gas customers (91% vs. 51% legacy Enbridge Gas customers), large customers (97% vs. 69% of small customers), those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in past 2 years (90% vs. 70% of those who have not), and those in the agricultural industry (97% vs. 68% manufacturing) are among the most likely to report ownership of the building(s) where their organization conducts its business.



Q2. Do you own or rent the building(s) where you conduct business?
Base: Total Respondents (n=105)

How Natural Gas is Used

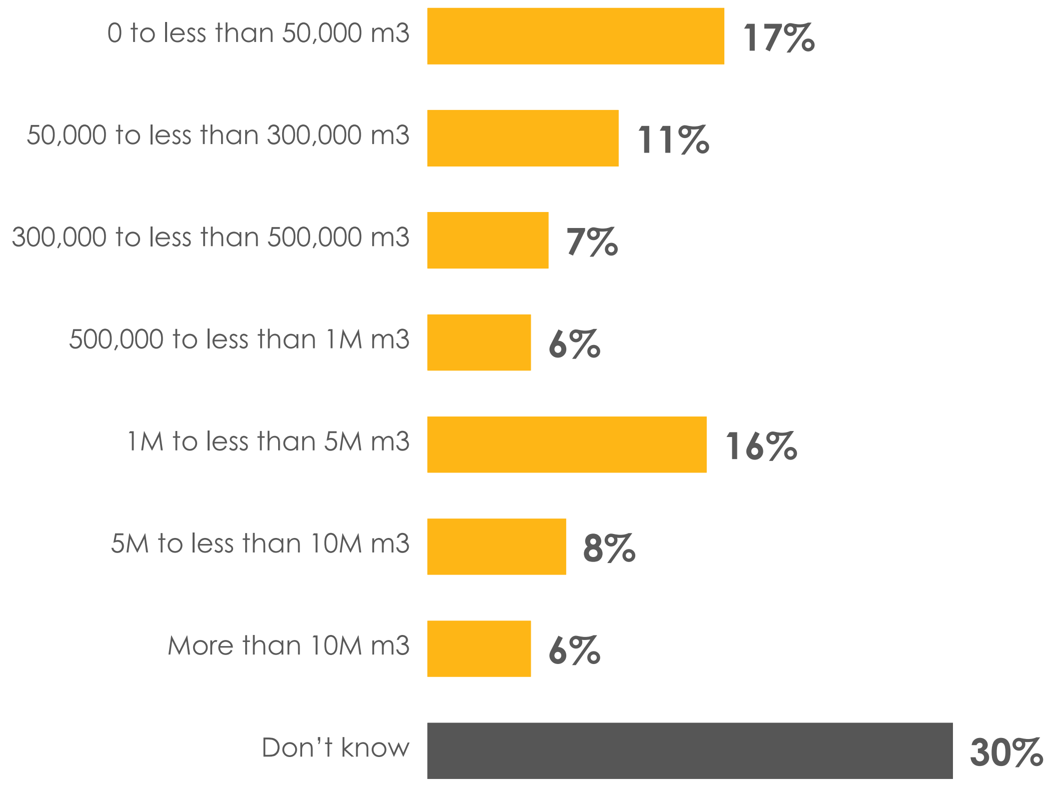
- At nearly nine in ten (88%), the majority of customers report using natural gas for heating or space conditioning. Seven in ten (70%) use it for water heating, and nearly half (46%) use it in production processes.
- Legacy Union Gas customers are more likely to use natural gas in production processes (61% vs. 14% legacy Enbridge Gas customers) or as feedstock (14% vs. 0%) and fewer use it for heating or space conditioning (83% vs. 97%). Similarly, those in the agricultural industry are more likely to use natural gas in production processes (75% vs. 36% manufacturing) or as feedstock (19% vs. 4%) but are less likely to use it for heating or space conditioning (75% vs. 94%). Large customers are more likely to use natural gas for water heating (88% vs. 63% small customers) or in production processes (64% vs. 38%). Customers who have a strategy for reducing natural gas consumption are more likely to use natural gas in production processes (65% vs. 40% no strategy) or as feedstock (20% vs. 3%).
- Those who have worked with Enbridge Gas to implement natural gas conservation projects/initiatives in the past 2 years are more likely to use natural gas in production processes (63% vs. 34% of those who have not) or as feedstock (18% vs. 5%).



Q3. How is natural gas used in your organization? Select all that apply.
Base: Total Respondents (n=105)

Annual Natural Gas Consumption (Reported by Respondent)

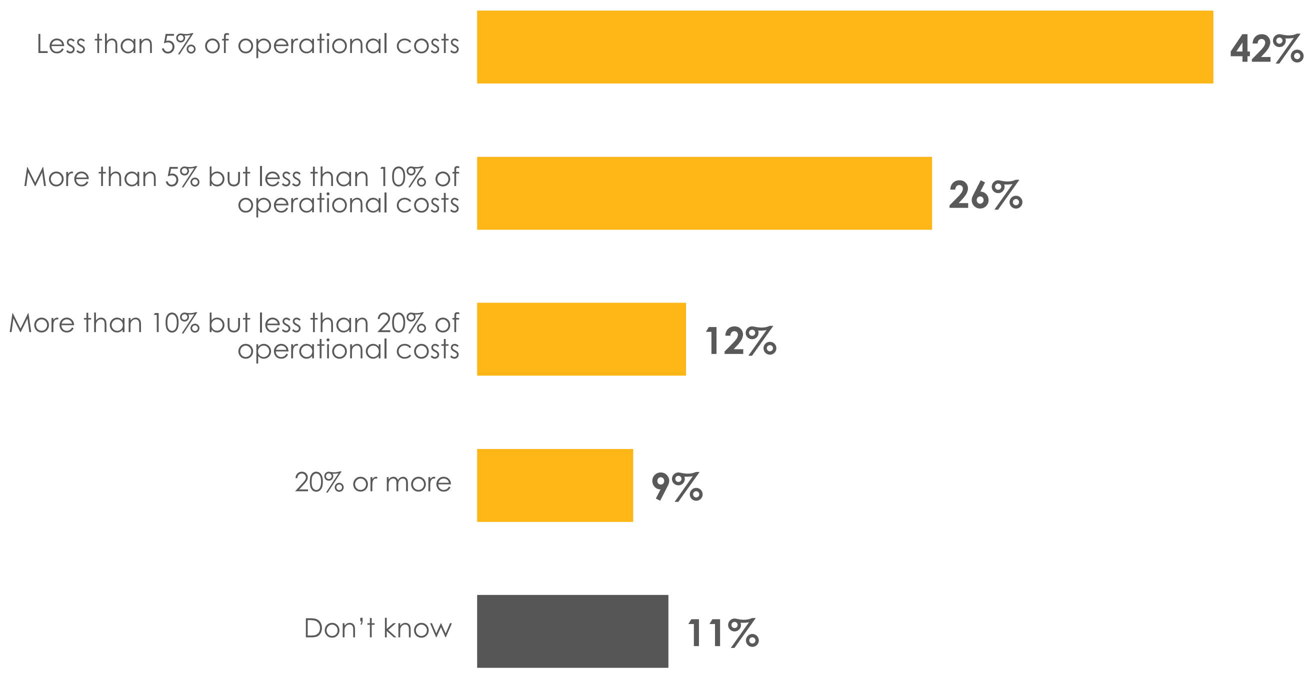
- Three in ten (30%) customers aren't sure how much natural gas their organization consumes.



Q4. How much natural gas does your organization consume within the average year? If this varies widely by year, please consider the last year. (Please note that M refers to million)
Base: Total Respondents (n=105)

Natural Gas Costs (Reported by Respondent)

- A plurality (42%) of customers report that less than 5% of their total operational costs are represented by natural gas. However, nearly half (47%) claim to pay in excess of 5% of operational costs in natural gas related expenses. As many as one in ten (11%) aren't sure how much of their operational costs are accounted for by natural gas.
- Legacy Union Gas customers (13% vs. 0% of legacy Enbridge customers) and those in the agricultural industry (19% vs. 4% manufacturing) are among the most likely to report spending at least 20% of their operational costs on natural gas.



Q5. What would you say is the overall percentage of your operational costs represented by natural gas?
Base: Total Respondents (n=105)

About Ipsos

Ipsos is the third largest market research company in the world, present in 90 markets and employing more than 18,000 people.

Our research professionals, analysts and scientists have built unique multi-specialist capabilities that provide powerful insights into the actions, opinions and motivations of citizens, consumers, patients, customers or employees. Our 75 business solutions are based on primary data coming from our surveys, social media monitoring, and qualitative or observational techniques.

"Game Changers" – our tagline – summarises our ambition to help our 5,000 clients to navigate more easily our deeply changing world.

Founded in France in 1975, Ipsos is listed on the Euronext Paris since July 1st, 1999. The company is part of the SBF 120 and the Mid-60 index and is eligible for the Deferred Settlement Service (SRD).

ISIN code FR0000073298, Reuters ISOS.PA, Bloomberg IPS:FP
www.ipsos.com

Game Changers

In our world of rapid change, the need for reliable information
to make confident decisions has never been greater.

At Ipsos we believe our clients need more than a data supplier, they need a partner who can produce accurate and relevant information and turn it into actionable truth.

This is why our passionately curious experts not only provide the most precise measurement, but shape it to provide True Understanding of Society, Markets and People.

To do this we use the best of science, technology and know-how and apply the principles of security, simplicity, speed and substance to everything we do.

So that our clients can act faster, smarter and bolder. Ultimately, success comes down to a simple truth:
You act better when you are sure.

2020 INDUSTRIAL NEXT GEN DSM CUSTOMER ENGAGEMENT RESEARCH: IN-DEPTH INTERVIEWS

APRIL 2020
Qualitative Research Report

CONTENTS

METHODOLOGY & OBJECTIVES

METHODOLOGY: IN-DEPTH INTERVIEWS

In-Depth Interviews

- A total of 9 In-Depth Interviews were conducted with Industrial customers of Enbridge Gas Inc. These took place between March 17 and March 27, 2020. All were conducted by telephone.
- Customers were identified by Enbridge and categorized as Large Participants or Non-Participants.
- Customers were either legacy Union Gas or legacy Enbridge Gas as outlined in the table below.

	Legacy Union	Legacy Enbridge	TOTAL
Large Participants	2	5	**7**
Large Non-Participants	1	1	**2**
TOTAL	**3**	**6**	**9**

EXECUTIVE SUMMARY

Ipsos

EXECUTIVE SUMMARY

ENERGY CONSERVATION

- All study respondents use natural gas within their business operations and for space conditioning, although the proportion of consumption is much higher for their business operations in manufacturing and production processes – as such, reducing consumption and therefore costs is of great interest.
- Most respondents were not solely responsible for energy management and conservation, but were facility managers, engineers, plant or facility managers, or were tasked with operational innovation or identifying and realizing cost savings.
- Many companies do not have formal sustainability goals or energy management plans in place, and further, lack internal resources to assign responsibility to these tasks; the exceptions are large multinationals who have dedicated resources, plans and sustainability goals.

WORKING WITH ENBRIDGE

- Awareness of available services and supports amongst Participants was high, but there can be internal barriers to taking advantage of them. These included a lack of available internal or dedicated personnel, the need for a compelling business case with a payback period of less than 2 years; or a lack of available capital, or other capital projects which are of greater importance or interest.
- Amongst Non-Participants, there was awareness of available services and supports, and appreciation for the education they are receiving from Enbridge about future possibilities.

EXECUTIVE SUMMARY

- Non-participants had just started working with Enbridge or intended to in future based on experiences at other companies. They did not have any additional barriers outside of similar ones also mentioned by participants.
- Many companies also undertake electricity conservation projects, but not all respondents were familiar with these, as there may be a separate person or team who works on these. There is much interest in these projects due to the high and volatile price of electricity.
- For those who work with electric utilities or have familiarity with the process, the relationships are generally positive although mention was made that they can be more functional and less holistic.

NATURAL GAS CONSERVATION IMPLEMENTATION

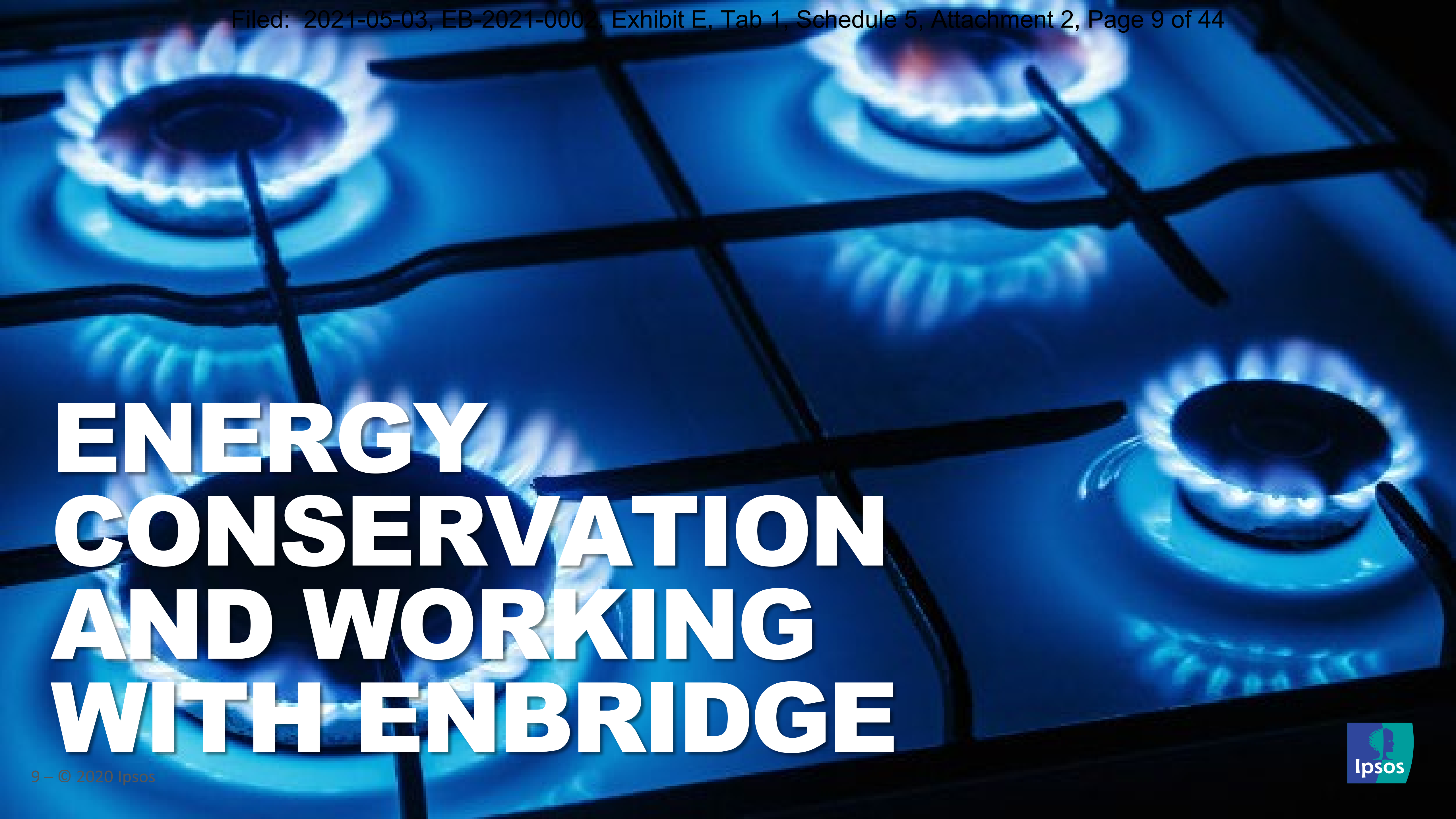
- Participation in natural gas conservation projects varied by company although most had undertaken at least one; of those who had not participated, they had either just completed their first project or intended to do so in the near future.
- Financial incentives are often a crucial component in making a business case for a project, especially in bringing the payback period within the 2-year timeframe required by decision-makes to approve a project.
- Respondents characterized their working relationships with Enbridge positively – because of long-term relationships, positive past experiences working together on projects, and because of the high level of service they receive.

EXECUTIVE SUMMARY

- The working relationship is often viewed as a ongoing partnership that has resulted in reduced consumption and real money savings.
- Respondents are appreciative of the technical advice and expertise they received at all stages of a project – in auditing the need and doing calculations of potential savings, providing recommendations on trusted vendors and contractors, and in measuring success after project implementation. Use of these services varied by respondent, with some requiring more input or advice at certain stages than others.
- The services and incentives provided by Enbridge are considered to be sufficiently or very flexible to meet their natural gas conservation project needs.
- Most felt that they had learned about natural gas conservation and thermal energy as a natural result of working on projects with Enbridge, and this was viewed positively.
- Both non-participants were very interested in working with Enbridge in future, although interest in specific types of available services and supports was mixed.

FUTURE NATURAL GAS CONSERVATION PROGRAMS

- Most stated that for the future of the natural gas conservation program, they are looking for more of the same in terms of having a holistic partnership which identifies opportunities for services and supports at all phases of the project. Some mentions were made in terms of specific items which could be future opportunities for Enbridge to pursue.



ENERGY CONSERVATION AND WORKING WITH ENBRIDGE

Use of Natural Gas

All participants use natural gas in some form in their production processes and this consumption is proportionately much larger than other uses such as heating – as much as 90-95% on processes compared 5-10% on space conditioning and water heating. Processes included various business operations and industrial equipment uses.

Because of the amount of natural gas consumed, and associated costs, many companies are highly motivated to conserve natural gas in order to lower consumption, and therefore, cost. There is less motivation to reduce consumption purely for space conditioning since the proportionate use is typically much less.

> *[…] generally, we're probably I would say 95% production, maybe even up to 98 or 99. While we might use a lot compared to home users for miscellaneous things, because we're using, I think we're using two to three million cubes of natural gas a year just for our plants. I bet probably, what's 1% of that? 20,000? Yeah, probably 98% is an estimate of our production.*

> *We're always trying to reduce the amount of natural gas we're using, specifically because it is such a large expense of ours.*

Support for Energy Conservation

Most characterize energy conservation as an endeavour that is worthwhile, but it is a goal that competes with many other of the company's priorities and interests. The primary goal in reducing consumption is to save costs; other considerations are to reduce waste, increase efficiency, comfort, and optimize of processes.

Most organizations do not have any long-term or short-term corporate sustainability targets and for these companies, their conservation goals and projects are undertaken on an ad-hoc, as needed basis. Some are early in the process of exploring energy conservation opportunities and have identified or hired a person internally to further investigate these opportunities. New capital projects or the future expansion of current projects of which energy efficiency or conservation may be a consideration are being investigated accordingly.

We do have sustainability targets. The initial one contributed to costs, but of course the best way for us to save cost on natural gas is to be more efficient. But we do track our gas consumption yearly. It is part of our ISO target to reduce consumption.

I would say that there is a strong interest in sustainability at the executive level, and certainly it's part of the discussion. But I don't think we were able to set clear objectives until we began to measure the energy performance of some of our facilities. That's kind of where our process is. I think it's more of a technical process for us. But part of the sustainability was the fact that they allowed me to delve into that. There was an investment. They invested in my time, and said, "Go find opportunities." I would say that was the primary impetus to begin with.

Support for Energy Conservation

Larger multinational companies are more likely to have corporate sustainability goals and express concern not only about greenhouse gas emissions, but other environmental considerations such as water waste, steam usage, and electricity conservation. They are much more conscious of GHG emissions and aim to reduce these as much as possible, although there is some uncertainty or questions about the impact or significance of reduction.

Other companies are less aware of or concerned with GHG emissions, particularly large multinationals, although a few have considered these in terms of fuel source or future capital planning investments. There was mention made that although GHGs might be a concern, they are unavoidable due to the nature of the operations and processes used, and that there are other considerations such as safety or process optimization that drive fuel choices.

We do have an awareness, and we do look at when we have an opportunity for savings, we look at, is this going to affect greenhouse emissions, yes or no? But it's honestly difficult for us to say, if we've reduced greenhouse emissions by a number, 100 tons. Do we know whether that's significant or insignificant? We really, I don't think we know. But we still have an interest and we still want to be conscientious.

We have considered other [fuel sources] in the past. Now we are sort of pigeoned in with our environmental concerns, that we can't run too many different sources. We can only run a few types of fuel oils, like a little heavy oil, such as if it's thicker than gasoline, we call it Number Two fuel oil. But we have considered kerosene, ethanol, gasoline, electricity, coal. We've considered a lot. Fuel oil, jet oil, propane, and natural gas was one of the more cost efficient. The only one that was more cost efficient was coal. But again, coal was the worst for the environment, so for us, [natural gas] was the best option.

Electricity Conservation

For some, electricity conservation was considered a higher priority due to the higher cost of electricity in Ontario – even in situations where consumption of electricity is lower than natural gas because the cost of electricity is much higher. Others view the value of both types of conservation projects equally.

> *I think that electricity is more urgent, because it has proved to be more volatile [in terms of pricing]. And as a unit of expense, it's greater […] The pricing structure for electricity drives us to be more attentive recently to electric costs. And so, we have conducted energy assessments, we have characterized how our business operates in terms of electricity, and we have changed our operation based on costing, on electric pricing. That's not true with natural gas.*

> *From a cost perspective, electricity is way, way, way more. But I think we've done projects on both sides of it, to be honest. I think to some people, the electricity is easier to see the potential because of the big savings, or because the big expenditures of small savings can be more money in your pocket. But I think they both hold equal value to us.*

Electricity Conservation

While some respondents were jointly responsible for natural gas and electricity conservation (as well as water and steam, in a few cases) others had a separate person or team who looked after electricity conservation and so these respondents were unaware of electricity conservation activities, although they had some high-level awareness that projects were taking place.

> *[I'm] looking after the energy issues for the company […] Basically all the utilities, the hydro, the gas and the water. We want to consider, to look at ways that we can save on energy and of course, when we receive all the invoices, we look at it and make sure that we're on the right track with what we are purchasing and whether we need to do anything drastic.*

> *Initially, it was a combined team just for energy, and at some point, I can't remember the year, they decided to focus a little more, so they split one into electricity, and one into natural gas.*

Responsibility for Energy Management

Most companies do not have a dedicated internal resource and/or technical expertise devoted to energy management. Instead, most have a person in another role such as innovation, engineering or plant management, where overseeing and implementing natural gas conservation has been added to their responsibilities. This person typically came into the role in a natural way – i.e. they were designated due to past successes or technical expertise, or they have been tasked with cost containment generally.

Some are more hands-off and at a corporate level, while others are on the ground at the plant level, and so their levels of involvement vary accordingly. Outside experts may also be brought in as needed.

I think it's mostly because no one else wants to do it. Everybody has their own jobs where I work and this wasn't a full job, it was a sort of a role and so it's just been since, incubated within the engineering department because it involved you know, affecting changes to improve efficiencies and so on.

We have internal [team] members like myself who plot projects. But as far as expertise, we will bring in external expertise, for instance, with the furnaces, we have an outside contractor that we use if we're doing say, engineering studies, or want to get into the mechanicals of how to do what we want to do.

I'm the maintenance manager and facilities manager. Therefore by default, I get to do all the facilitating with any kind of energy savings also.

Energy Management Plans

Most, except for those working for large multinationals, did not have a formal energy management plan in place. This was inherently tied to a lack of dedicated internal resources who would have the time and bandwidth to put one together. Many simply have a mindset or culture of efficiency and mitigating waste.

A formal plan was considered an aspirational goal that would be ideal to have in future but is not currently feasible or considered a top priority by their companies.

We lack the support staff to really put it together, and to track it, and to do everything. It's more of just the mindset that everyone needs to have to conserve as much as possible. […] So really, on a good day, they're only using the natural gas to light the burners […] That's the direction they've been given, and they're only to really use natural gas when they have to.

We could definitely benefit from, I think the company would make use of someone who's focused solely on [an energy management plan]. And maybe in the future, we will have someone. But we're getting there. [Our industry] is a little slow. We're probably about 10 years behind the curve.

Tools and Resources

Many rely on Enbridge and other utility partners to ‘fill the gaps’ in terms of knowledge, tools and resources to undertake conservation projects. This might include support and expertise in conducting assessments, putting together the figures and numbers to build a business case, in recommendations for third party contractors and experts, and in understanding industry-specific or general best practices. A few characterize these as equally or more valuable than financial incentives.

> *I think they have limited tools, but they recognize that there’s talent that we can bring in to help us do the assessments, to help us do, like when we go to a bidding or costing process, and then when we go through the actual project itself, most of that work is done by local third party contractors. But we do rely on our utility partners to help give us some guidance and direction on what works, what doesn't work, say when we ask for a recommendation on list of contractors that other clients have had a good experience with, those are the types of things that are really important because we’re in most cases somewhat blind to that process. We have very capable engineers, but they do better when they are given a head start.*

> *It really helps if you get the savings estimates, because then you can at least put a dollar figure to a project proposal. So I found that was a really good resource to have, and just walking through the steps of what needs to happen. The payback seemed more than fair for what we were doing, and I don’t really think there’s anything too much more they could do to help. Again, the benefit is having that resource of the Enbridge rep, and if they’re a knowledgeable person, and the lines of communication are open, it helps a lot. It helps streamline the project […] I found his technical knowledge was really good. We obviously did most of the project planning ourselves, but having that outside resource who has experience from a number of different organizations is always a good asset to have.*

Relationship Building with Enbridge

There was a mix of experiences in terms of how respondents became aware of Enbridge's available technical services and financial incentives.

Some had an Enbridge representative proactively reach out to tell them about available services and incentives or to ideate about potential projects. There was some questioning for these respondents as to why a company would offer free services that would lower use of its product, but these concerns were overcome once the respondent gained a better understanding of the overall goals of Enbridge in natural gas conservation, and once a relationship was developed over time.

Enbridge came to us […] initially I was actually kind of skeptical because I didn't understand why, it was a different time too, looking back […] years ago. I don't think there was as a big of a focus on conservation as there is now. But back then when he showed up I was trying to wrap my brain around the company that sold us the gas, why would they want us to conserve it? But I later learned that it was kind of a separate division within Enbridge that took care of this and it was their sole purpose of that group to spearhead the efficiencies within industry in Ontario. It made more sense later but it didn't make sense when they first showed up.

[…] my Enbridge representative came to me and said, "They're doing this at this facility, and we would like to have you go there and talk to them." There was an agreement between their Enbridge representative and ours. We had a visit to their facility, they gave us a presentation, they showed us what they were doing, how they were doing it […] because that facility didn't really have a team for conservation. So we shared with them our team structure, how it was created, the benefits that it's given us over time. Because of this facilitated meeting between the two different companies, we each came away with a benefit out of it, and that was all organized by the Enbridge representatives. That visit is what led us to commission the full engineering study on the feasibility of implementing the same system here as they were using.

Relationship Building with Enbridge

Some reached out to Enbridge themselves to see what if anything was available to them, or feasibility and best options, when undertaking projects such as cost reduction initiatives, or plant expansion, already being developed.

The Non-Participants were aware of Enbridge's services and had either just started using them, or intended to in future for expansion projects based on past positive experiences working with Enbridge at other companies. Both Non-Participants already had contacts at Enbridge who they were building relationships with and these were characterized positively.

I believe that when we started […] we made our first contact. At that time, it was Union Gas, and we had been dealing directly with a representative from them up to date. And now with the Enbridge-Union Gas merger, essentially I'm dealing with the same person, but it's under a different banner now.

I think our Enbridge rep happened to be in the area, and stopping by, and I was talking to him about the project that was coming down the pipeline in a couple months, and he was telling me that there was some savings and some payback that we could potentially get if we go through all these necessary project steps. So then we started working on that together.

Project Lead Time

The lead-in time and approval process itself also varied from company to company; however multi-year projects were rare and lead time was typically within a year as energy projects were evaluated alongside other capital projects on an annual basis. The lead time could be shorter for those companies not requiring a long approval process.

It's generally over a year, because we have our base here where we're identifying projects. Then we have our budgeting event, which is usually at the end of the year. And that's where we traditionally assign projects based on the budget. And then we execute the project, and the project execution is in the following year.

[Lead time] depends on the complexity of the project. The biggest projects we have done could be a year in the planning. We have smaller ones that could be completed in a month to three months.

Building a Business Case

Responsibility for building the business case fell to the respondent who participated in the interview. While some acted independently in this capacity, others had colleagues or external resources involved in helping to build the business case.

Having Enbridge partner with the respondent in quantifying savings was considered tremendously valuable by those who used this service – either because they didn't have the technical knowledge or internal resource to do so themselves – and so this was crucial in helping to build the business case.

I would say it's multiple responsibility, the individual in the team member could be given a task and would be their responsibility to lay out the requirements. For larger tasks, it could be a team effort, include non-team members like maintenance, support, and again if required, outside support.

[…] that's really where the great power of this is, it's not, from my perspective anyway, it's not the fact that they give away money. that's probably what a lot of people would have a perception of as, facilitates the grants and all that kind of thing. But from where I sit it was, the biggest benefit that we got from these guys, this group was that it kind of helped identify where the opportunities were, then brought in people who knew how to measure these inefficiencies and give proper recommendations on how to fix them and what we could expect in terms of savings. It helped with that initial list that I was telling you about, we ended up paring it down and realizing which ones were the gems and which ones were the lemons. This kind of assistance that they brought to bear on this thing.

Opportunity Identification and Assessments

Awareness of Enbridge's technical services and financial incentives was high. Many had utilized Enbridge's services on past conservation projects and found this to be an invaluable resource throughout the life of a project – this was true for both Participants, and Non-Participants.

For some, having Enbridge proactively identify opportunities, or turning to them for advice on potential projects was considered instrumental in starting the process. For companies with a lack of internal resources, having Enbridge's expertise to fill assessment gaps if needed was of great value, while other companies were able to conduct their own assessments. For those who took advantage of available incentives these were considered important or crucial to having the assessment done.

> *They provided us with some funding to help with some of the engineering, going around analyzing what we were seeing, and then based on the actual reduction we were able to obtain some rebates from Enbridge around that. So, that was a great initiative.*

> *We've done both facility assessment[s] with Enbridge, and we've asked for their guidance on projects that we've selected. And we've solicited funds and received them from Enbridge for assessment work, as well as for installation. I would be quick to say, it's unlikely that we would have done these projects without that support.*

> *We did some savings estimates when we started discussing this one project, but we never did any auditing. I know [our rep] recommended we could do some, but again, it would require more investment, which we weren't going to get at that time. But he was able to help as much as he could with our investment level, basically.*

Enbridge's Technical Resources

Enbridge engineers and technical resource(s) were able to provide or bring in specific knowledge about each company's processes to the project. Receiving recommendations on contractors or trusted vendors was also a helpful service that drove the process forward and made the projects easier to assess and implement.

Having knowledge and best practices from other companies, even those from other sectors, was valuable to many. Understanding and knowledge of new technologies, innovations related to conservation is also of interest.

> *[Enbridge] come up to the plants, they help us with the ideas. We have no tools. Like I said, we don't even have the time. What they're giving us is modeling softwares, and they're showing us some modeling, telling us how much energy we can save. We also do projects, studies with them.*

> *[…] the biggest benefit that we got from these guys [Enbridge], this group was that it kind of helped identify where the opportunities were, then brought in people who knew how to measure these inefficiencies and give proper recommendations on how to fix them and what we could expect in terms of savings.*

> *If something can spread that kind of information to all of us that would be great because you don't know how that will come up with some innovations so some new ways of saving gas that we're not aware of but they are aware of that. Maybe they are spreading the news to companies that are not very active here, that would be great. Just to keep abreast of technology.*

Payback Period and ROI

An acceptable payback period for energy conservation projects was two years (maximum) or less, some said payback would need to be within 1.5 years or less.

Most said that this is consistent with expected payback on other comparable capital or non-energy projects; however, a comparison was not always relevant in that other projects might be considered of greater importance to the company's operations, or that the energy conservation project was a part of a bigger project rather than being a standalone project.

We would not take anything over a two year pay back. Usually 1 or 1.5 payback [years] is reasonable to get approval from our leadership team.

If I wanted to go through easily 1.5 years, anything over two years will receive extra scrutiny.

It depends on the project, it depends on the activity. Some projects have huge payback, but they don't pass the go ahead gate due to other factors. It's one consideration. Typically, a one-year is something that could be looked at for a typical project.

Role of Financial Incentives

The financial incentive was characterized by most as a key component in driving the business case to get the go-ahead and implement a project, particularly when the incentive drove the payback period down to within the required 2-year window.

Some took advantage of financial incentives such as auditing or meter installation to build the business case; most took advantage of financial incentives tied to implementation of the project.

In the case where the project would move forward regardless of an Enbridge incentive, these were not standalone energy projects; nonetheless the incentives were appreciated.

And the financial incentive definitely swayed our decision to do it, because being how this additive is a cost, I would never have gotten my management to approve any sort of cost like this without having some sort of backup […]

I think [financial incentive] is a very strong selling feature within the company to present a project that the utility has so much confidence in the outcome being beneficial, that they're willing to put up money. That's a very strong sign that we're going to have a good project.

At the end of the day, we actually got a substantial reimbursement from them for savings […] It was incentive based on how we implemented. So they were able to say, "Okay, because you did it this way, and did it that way, then we'll give you some money back because of knowing that you guys are going to conserve on a certain front."

Conservation Project Approval

All respondents have some form of approval they need to get internally before proceeding with a natural gas conservation project.

This varied from company to company – senior management or executives, board of directors, or CEO. Approvals in larger companies might also depend on the size of the project – that is, the ones that require a larger investment would need to be approved by a higher level.

[…] there basically is a committee that exist in your leadership team. It's usually headed by the general manager of the plant. He does establish the priorities, and he makes a recommendation based on those priorities. Utilities are rarely registered as the highest priority."

]…] we have to go through our corporate level to get there. I basically will propose a project to our plant manager, he then proposes it to the corporate level, and they get all the necessary funding to do the project if it's approved.

[…] well there's a whole process. How it works, it depends on how big of a number it is. […] And it just depends on how high in the operation or in the organization I have to present it to.

Measuring Consumption and Savings

Natural gas consumption was measured by some companies as a KPI – although typically not a principal one – and this was most commonly in terms of cost per product or unit. A per unit figure is based not only on natural gas consumption, but other costs as well. Many organizations have had success in reducing consumption as a result of a completed project.

Others did not have it in place as a KPI although they did have benchmarking or a range in terms of their overall consumption which they measured after the project took place.

We have a monthly readout of costs by facility, and natural gas and electricity are the primary utilities that are associated with those costs. As a KPI, we look at the total natural gas cost. And more recently, we've tried to evaluate the merits of trying to unitize that using a production criteria. Although it's not a principal KPI, it is something that we use to determine effectiveness. We look at either kilowatts, or we look at natural gas consumption, and then we compare that with our production numbers that we associated with that.

We will look at gigajoules per ton, is the KPI. The amount of energy that goes into making a ton of product comes in the form of natural gas and electricity […] There's typically the targets are released at the beginning of the year, and your target, whatever it was last year, good job. It needs to be reduced […] year over year.

Measuring Consumption and Savings

The number of meters installed was a factor in measuring consumption with those who had more meters or some form of load management were better able to pinpoint the item(s) of greatest consumption. These were characterized positively as important tools in facilitating concrete metrics in assessing and reducing natural gas consumption, both generally and in terms of production.

Those who did not said having more meters installed would be of interest, but that cost was a barrier to installing these.

[…] one of the projects that happened […] years ago, is Enbridge helped us put in gas meters all over the plant. It was one of our things that they helped […] and so we were able to actually track the downward curve, I guess, in the usage of natural gas in the plant. We also measured as a KPI against our production so you know, it's not just a matter of going the gas usage is going up and down with production but it's measured against the production. So we measure the number of cubic meters of natural gas used for each these areas against, and we divide it by the number of square meters of [product] produced in that area.

It is something that we want to add in is a KPI. And there's been many discussions from my perspective as to, we currently can't meter it fine enough, so we don't have enough metering locations. We have one big meter that comes into the plant, so it's too hard to pinpoint where we can start saving that way. There have been some talks and some discussions as to starting to implement individual meters at different source locations, so that we can do a better job of monitoring that. But it's been some talk definitely on the table, but at this point it's kind of sitting there, to be honest.

Enbridge Service Flexibility

All respondents characterized the services offered by Enbridge as being sufficiently or more than sufficiently flexible to meet their needs. Because most have an ongoing relationship with Enbridge this is facilitated by an open, two-way dialogue about their needs and they said that suggestions were often proactively made by their contact in terms of ideas and projects that could be implemented.

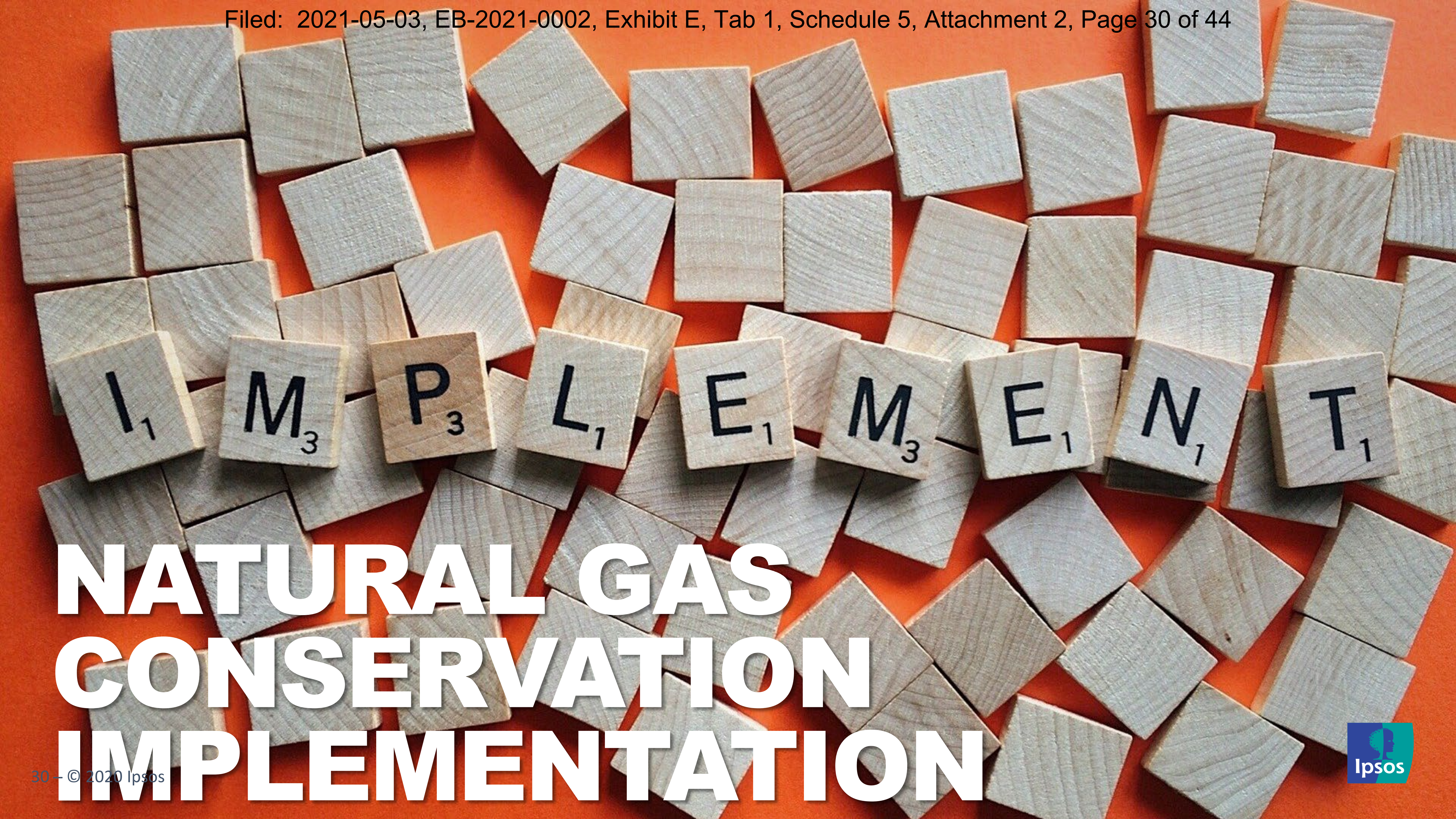
While incentives were considered flexible, a few wished for a greater level of incentivization, while acknowledging that there may not be funds available to facilitate this.

[…] they're very flexible with the projects we do, and they're very flexible with different ways, and they're really open to different ideas. They're just good to work with. They work with us at our pace, whenever we need them they're there.

Our Enbridge rep has been pretty good at describing everything we need, and helping me gather and get whatever data we need to submit to complete our application.

[…] the incentives through Enbridge seem to be more flexible on timing than other energy team initiatives I've done, for example with the electricity side, it tends to be far more regimented, not as flexible as Enbridge can be.

[…] the guy we were working with did a really good job. He was very, very conscientious, and not afraid to follow up, and give us the information we needed. I had a really good relationship as far as that's concerned.



NATURAL GAS CONSERVATION IMPLEMENTATION

Natural Gas Conservation Implementation

Only a few companies have an internal project 'champion' who oversees the implementation of conservation projects. For some these individuals were part of a group who are responsible across the organization, which might also include those who are more on the ground or closer to plant operations.

Others do not currently have a champion in place per se, mostly due to a lack of resources, tools and manpower.

I would say our general manager would have been the champion, once he was made aware of the opportunity. But we also had an internal project manager, an engineer who was on board with the project from the beginning. So, we kind of made sure we had somebody at the leadership level, and we had somebody at the implementation level.

There's a few of us that see the value of it, but it's kind of one of those things, when we have time we'll get to it. Running a plant can be a challenge at best, so it definitely gets forgotten. There's no question about it.

It's not just me. I've only become involved because I wanted to become involved. Otherwise, really the owner keeps check on it, and that's about it. I've gotten involved because I've seen a benefit to us, and I see how, because I control the products we use, I control the mixes, I've found that we might have some savings because of it. That's where my involvement began. But as far as is there a person? No. Am I in charge of everything? No. I look after the plants I look after, but only perhaps the energy side. […] We leave it up to the individual operators of the plants to try to reduce their energy.

Project Implementation

In terms of implementation, complexity and involvement of others varied – the degree to which others were involved depended on the size and scale of the project – for example, on a project where the whole plant was shut down then this involved everyone who works there in the sense that they would no longer be working.

Most characterized the implementation and communication as being relatively straightforward although there was mention made of concern by those "on the ground / floor" who might be resistant to change or new technology, or feel that new technology might pose a threat to their job security. That said, these concerns were overcome with time and communication that there were other roles or functions that these workers could fill instead.

> *People don't like change. There's always going to be disappointments, and technical disappointments. Is everything in every situation going to be as good as it was? Maybe not. But we're still working out some, I would consider them minor technical problems, but for the most part, it's been accepted.*

> *It [the project] was communicated across to everybody, because we were down for a couple days as a result, which shut other areas of the plant down. Everyone was well aware of what was going on.*

Project Success

Most believe that the project(s) implemented have been a success, on a number of fronts – cost savings, reduction in consumption, being integrated into plant operations, or meeting other objectives as identified at the outset of the project. There were a few technical issues mentioned experienced by a few, generally unrelated to Enbridge's role in the project.

Many have undertaken more than one project over the years and are open to implementing more, if the projects continue to meet the company's criteria for payback, cost savings, and meeting other objectives. While having more tools and resources available internally would be a desired outcome for some, having Enbridge fill these gaps is invaluable. Financial incentives would continue to be a crucial component in future.

> *We realized the benefits operationally. The icing on the cake was that we received some funding to cover off some costs, which was great, and I think that really helped build the trust relationship between us and Enbridge. Most recently, with the economizers on the boilers, I think the great thing is they made the process very easy.*

> *Yeah, if they could develop [an energy management] plan for us, I'm sure we could figure out some way of distributing some responsibilities across the staff we do have. It would at least be a step forward.*

Working With Enbridge

All participants characterized their relationship with Enbridge positively and had difficulty identifying any drawbacks to their working relationship with Enbridge. Enbridge's role in projects varied by company and depended on the origin of the idea – in situations where Enbridge suggested a project, they were likely to be involved from start to finish although the level of requirement involvement would still vary.

Others had projects already in place (expansion, purchase of new equipment, corporate level sustainability initiatives) and reached out to Enbridge on an as-needed basis. Some had third party experts and contractors involved in implementation. Some took advantage of recommendations of Enbridge's outside expertise, while others already had their own contractors, engineers etc. in place.

> *[Enbridge] made high-level recommendations about what their experience was, what technologies worked the best, what the drawbacks were for the space heating that we were doing. And based on that, we said, "Okay, we're going to go with the technology that you think would work," and we put in some pilot units, tried them out. They worked.*

> *[…] it's been good. Good relationship. I never have any problem getting contact information I'm looking for. They're always open and helpful.*

> *They're very good. One of the guys, he always says that he wants us to focus on the relationship first, and then work later, which is nice to hear that…They're good at building relationships. I understand what they're trying to do with the whole energy savings model. I think it's obviously it's great for us, because it helps us.*

> *And Enbridge did a great job there with us […] they interact with the site enough to know what our processes look like. And yeah, they've been keen in the past to keep us abreast of what's coming up next.*

Working With Enbridge

Most were very satisfied with all aspects of their relationship with Enbridge and most did not have any further thoughts or ideas on what more could be done to improve their relationship. The time spent was typically well worth the effort in that savings have been realized as a result of taking on the project; and further, many have developed long-term positive relationships with their account representatives.

They appreciate the initiative that Enbridge demonstrates in challenging companies to conserve as much natural gas as possible, while striking a balance of not being too pushy, and identifying projects that actually bring value, rather than being a 'sales pitch'.

> *I appreciate what they've done, and I would like to do more projects. I think the key for us going forward is finding other gas projects, gas-related projects that have an attractive return on investment.*

> *I think [Enbridge] did a really good job. I think anytime we had any answers or questions for them, they were quick with answers, and I would say even before to the point of challenging us, "Is there anything more you can do? What about this? What about that?" And asking other questions of us. I think I was quite satisfied.*

> *That's actually very unique, I've got to be honest with you, I've been doing this job for like you said over 30 years and I've never seen anybody actually come to help us and not have some other agenda […] Other than Enbridge.*

Working With Electric Utilities

Perceptions of working with electrical utilities were mixed and not all respondents were directly involved in these projects. Some stated that their relationships were positive and that they worked together closely with their electricity utilities.

However, mention was made that electrical utilities are less responsive than Enbridge, or that they found the relationship to be more functional and about filling out applications for incentives, rather than being more holistic about identifying opportunities and working together closely. Experiences can also vary by utility.

[…] the electrical side, the incentives seem less flexible. I find that I haven't been on the electrical team for some time. But when I was there, their representatives were flexible, and helpful, and informative, it's just that their incentive system was a little more rigid.

I'll be honest, I think both of them are very good. Both of those utilities, both push us to the right amount. How's that? So, they encourage without being annoying, because they realize we have other jobs to do too.

Our work with the electric utilities has been mixed. We have one that's very good, and one that's pretty much non-existent.

Natural Gas Conservation Learning

Many felt that they had learned about thermal energy and natural gas conservation as a result of their relationship with Enbridge.

Mention was made by a Non-Participant that Enbridge has actively reached out to respondents to identify and educate them on conservation opportunities, while others have learned more about this area as a natural result of working closely together with Enbridge.

> *I think just learning about what the different technologies are that are available. That was helpful. We clearly didn't have, we were just using the wrong type of space conditioning technology. Learning that was probably the most illuminating part of the technical project.*

> *[…] our admin advisor for energy solutions at Enbridge and […] this information has been passed on to us already and we have achieved quite a relationship with her and she has invited us to a lot of maybe workshops or seminars and passed on information to me regularly and once we're anybody else to start taking advantage of all this we will because I know they are available. And I've learned this in the past from a different company. And I've tried to do the same thing for my new company here […]*

FUTURE NATURAL GAS CONSERVATION PROGRAMS

Future Natural Gas Conservation Programs

Most were very satisfied with the current scope, level, and relationship of the natural gas conservation program through Enbridge and feedback was overwhelmingly "more of the same" as a desired outcome.

Some suggestions were made of additions or changes that would be of value:

- Specific expertise or competency in each company's technical processes
- Supporting point of use measurement, i.e. metering on every process
- Educating companies and their employees about overall conservation goals, and how employees on the floor can identify and enable opportunities
- Identifying a champion – given a lack of internal time and resources
- Technology-enabled tools and hearing about the latest innovations
- Usage information / real time data (similar to what is provided by electricity utilities)
- Understanding climate impacts of consumption and positive outcomes in terms of GHG reduction

Future Natural Gas Conservation Programs

I'm a little unsure right now if they are still supporting point of use measurement. At one point, we received incentives for installing metering, to track, and then it changed […] But certainly, the incentives to help put in metering on every process is huge, and if they're not doing that, then going back to that would be helpful.

I think my biggest one is, it's still on my wish list, is to get individual meters in. I think because the discussion has started, I'm sure when the time comes, they'll be more than willing to help us. I'm confident with that.

On the process side, I think that there is less knowledge, in terms of conservation, by our facility people, by our people, the company's own people. So, I think if we could improve their knowledge, and their understanding of what they're up to, I think we would have a better shot at doing more process

I think other conservation initiatives, changing the dialogue from very technical to enabling people to make choices on the plant floor. So, if you can connect with people and show them how their decisions make and have an impact, that is key. We've always tried to approach it from, run your factory like you run your home. You don't leave your house in the morning and leave all the lights on, and the furnace on high, and stuff like that. We come to work and we don't have that same mental framework for some reason. We always think that somebody else is going to look after it. So, being able to do that would help us I think, from a conservation standpoint.

Future Natural Gas Conservation Programs

Definitely I need the person giving the support with tools that they have. I told you we have no tools, we have no people working on it, so I need that person to be there pushing it, motivated, for energy savings and following up with us.

[…] in terms of justifying projects, having real data before and after, both for Enbridge and for internally to justify the savings, it makes things much cleaner, because we have the data right there to show exactly what's happened.

I think like anything else, I think ideally without having somebody to champion those projects and make that their primary focus, it's pretty hard to give it the importance it needs. And not that it can't happen, but the timelines tend to get dragged on more, and more, and more, because other priorities get in the way. I think overall, having a champion is probably the best way to make it happen.

But for the program, I need the person pushing it. I need the financial, I need the technical support with the tools that they have, and just someone, the person is the most important. Just give me someone who can help me push these projects, and is caring about the projects, and that's really the most important to me.

Future Natural Gas Conservation Programs

I think just to let us know what's out there, the latest from the industry like, in order to be aggressive for these new innovations and what's happening there. What people are doing to save energy that we may not be aware of.

A hidden gem with [an electric utility in Ontario] is their interval data website. That would be a suggestion for Enbridge, is to provide an easy way for people to go in and look at their natural gas consumption real time. That way you can actually avoid buying complicated and expensive meters, if we can just get a tap into an existing meter […] to provide a view into a portal so that we can see it, and use that information wisely.

THANK YOU.

About Ipsos

Ipsos is the third largest market research company in the world, present in 90 markets and employing more than 18,000 people.

Our research professionals, analysts and scientists have built unique multi-specialist capabilities that provide powerful insights into the actions, opinions and motivations of citizens, consumers, patients, customers or employees. Our 75 business solutions are based on primary data coming from our surveys, social media monitoring, and qualitative or observational techniques.

"Game Changers" – our tagline – summarises our ambition to help our 5,000 clients to navigate more easily our deeply changing world.

Founded in France in 1975, Ipsos is listed on the Euronext Paris since July 1st, 1999. The company is part of the SBF 120 and the Mid-60 index and is eligible for the Deferred Settlement Service (SRD).

ISIN code FR0000073298, Reuters ISOS.PA, Bloomberg IPS:FP
www.ipsos.com

Game Changers

In our world of rapid change, the need for reliable information
to make confident decisions has never been greater.

At Ipsos we believe our clients need more than a data supplier, they need a partner who can produce accurate and relevant information and turn it into actionable truth.

This is why our passionately curious experts not only provide the most precise measurement, but shape it to provide True Understanding of Society, Markets and People.

To do this we use the best of science, technology and know-how and apply the principles of security, simplicity, speed and substance to everything we do.

So that our clients can act faster, smarter and bolder. Ultimately, success comes down to a simple truth:
You act better when you are sure.

ENBRIDGE GAS DSM PLAN – LARGE VOLUME PROGRAM

Large Volume Program Strategy

1. Enbridge Gas's proposed Large Volume program builds on the successes and learnings of the existing Large Volume program, with modifications intended to be responsive to customer feedback. Enbridge Gas reviewed a variety of inputs in designing the Large Volume program, including the following:
   - The objectives outlined in the OEB's December 1, 2020 letter (EB-2019-0003);[1]
   - The guiding principles outlined in Enbridge Gas's Proposed Framework;[2]
   - Lessons learned by Enbridge Gas while delivering offerings to the large volume sector; and
   - Feedback from stakeholders received through the course of the 2015-2020 Multi-Year DSM Plan, subsequent 2021 DSM Plan, and over the course of the development of this application.

2. The Large Volume program is directly targeted to the following rate classes within the Union rate zones: Rate T2 (Storage and Transportation Rates for Large Volume Contract Carriage Customers – Union South) and Rate 100 (Large Volume High Load Factor Firm Service – Union North). The customers in these rate classes are generally classified as industrial (e.g., steel, pulp and paper, auto manufacturers), chemical manufacturers and refineries, and gas fired electricity generators. These sophisticated customers have extremely high natural gas consumption and while some are competitively motivated to ensure their systems are efficient, others require the input of Enbridge Gas's Technical Account Managers and financial incentives to prioritize undertaking energy efficiency measures.

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[2] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, pp. 6-8.

3. Rate T2 is a contract rate for customers in the Southern operations area who actively manage their own storage services and require a minimum aggregated Firm Daily Contract Demand of at least 140,870 m^3 for all redelivery points.

4. Rate 100 is comprised of large commercial and industrial customers who have signed a Northern Distribution contract for firm natural gas delivery with Enbridge Gas. These customers are typically large manufacturers requiring a very large volume of natural gas for industrial processes – such as steel, pulp and paper and mining. These customers, located in Enbridge Gas - Union North rate zone, require a minimum consumption of 100,000 m^3 of natural gas or more each day. These customers must maintain a 70% load factor over the course of a year.

<u>Lessons Learned</u>

5. Large volume customers utilize very large amounts of natural gas in their operations. Energy purchases are, in most cases, a significant contributor to overall production costs. However, due to their focus on production, quality, reliability, and safety, energy efficiency is sometimes viewed as a less important priority. As a result, there is an opportunity to help customers with their efforts to optimize the energy efficiency of their operations.

6. Enbridge Gas's Technical Account Managers are Professional Engineers with expertise in industrial energy efficiency and natural gas applications. Technical Account Managers engage with customers to provide industry perspective, share best practices, and support project adoption. Technical Account Managers are assigned dedicated coverage to assist customers identify, quantify, test, track, and implement energy efficiency opportunities. In this way, Enbridge Gas is able to work one on one across the varied customer group, supporting site-specific solutions and

helping these impactful customers maintain engagement on energy efficiency as a focus.

Large Volume Program Proposal

7. In January 2016, the OEB issued its Decision and Order on the 2015-2020 DSM plans, in which it determined that “Union’s large volume customers should be part of Union’s DSM programs”[3] and further, “that the significant benefits of continuing Union’s self-direct Large Volume program outweigh the costs of delivery and it would be inappropriate to stop a program that has been so cost-effective.”[4]

8. More recently, despite many customers who have communicated their support of the program, a select few customers have suggested that the Large Volume DSM program should be discontinued. Specific engagement with large volume stakeholders is discussed in Exhibit E, Tab 4, Schedule 6. In an effort to appeal to all interests, Enbridge Gas has made two changes to the existing Large Volume program, as follows:
    i) To decrease DSM related rate impacts in the Rate 100 and T2 large volume rates classes, Enbridge Gas has reduced the Large Volume program budget, including proposing a smaller incentive pool available to these customers. The proposed Large Volume program budget has been reduced by approximately 20%. The relative program budgets are detailed in Exhibit D, Tab 1, Schedule 1.

    ii) Enbridge Gas has removed some current limitations on measures that are eligible for incentives. In this way, the customer will have an increased opportunity to utilize the program and the incentives, based on a broadened

[3] EB-2015-0029 / EB-2015-0049, OEB Decision and Order (January 20, 2016), p. 50.
[4] Ibid, p. 51.

range of potential efficiency projects driven by the particular customer's priorities and needs.

Objectives and Guiding Principles

9. The small number of customers targeted through the Large Volume program represent a significant portion of Enbridge Gas's overall natural gas throughput. There are approximately 37 customers anticipated in the combined rate classes for 2022, who collectively consume over 5 billion cubic meters of natural gas per annum, or approximately one fifth of Enbridge Gas's yearly consumption. Given the considerable volume, DSM activities amongst this group has the potential to have a large impact on overall natural gas savings and net benefits.

10. Delivering DSM programming to large volume customers is consistent with both the primary and secondary objectives outlined in the OEB's December 1, 2020 letter, as follows:

> …the OEB is of the view that the primary objective of ratepayer-funded natural gas DSM is assisting customers in making their homes and business more efficient in order to help better manage their energy bills.[5]

The OEB's letter further states:

> In working towards the primary objective, Enbridge Gas's ratepayer-funded DSM plan should also consider the following secondary objectives:
>
> - Help lower overall average annual natural gas usage.
> - Play a role in meeting Ontario's greenhouse gas reductions goals.[6]

11. The Large Volume program is also in line with guiding principles outlined in the Proposed Framework including:

[5] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p.2.
[6] Ibid, p.3.

- DSM Plans should be designed to provide opportunities for a broad spectrum of consumer groups and customer needs to encourage widespread customer participation over time and "ensure all segments of the market are reached."[7]
- DSM plans should include strategies to increase the natural gas savings by targeting key segments of the market and/or customers with significant room for efficiency improvements.
- DSM plans should minimize lost opportunities for energy efficiency and should be designed to pursue long term energy savings.

Direct Access Offering

Background

12. Enbridge Gas has been delivering the Direct Access offering to Large Volume customers since 2013. The self-direct model has been largely well received by participants with a few exceptions. The offering continues to drive substantial cost-effective results.

13. The program provides an important opportunity for Enbridge Gas Technical Account Managers to work with these key gas customers to continue to drive natural gas savings. The direct access approach compels these customers to work with Enbridge Gas Technical Account Managers to execute on identified energy efficiency opportunities and access their portion of available incentives and services. Importantly, even with current higher free-ridership rates, given the size of these customers and the volume of consumption, the program drives substantial net gas savings that are cost-effective.

14. Further, Enbridge Gas continues to believe, given the nature of the self-direct offering, all eligible customers are provided with the opportunity to use a distributed

[7] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

portion of the funds for energy efficiency upgrades reducing the risk of cross-subsidization.

Objective

15. The goal of this offering is to encourage Large Volume customers to maintain a focus on energy efficiency by encouraging the development of an Energy Efficiency plan and take action on identified efficiency opportunities.

Target Market

16. This offering is delivered to customers in Rate T2 and Rate 100 in the Union rate zones. These customers are generally classified as Industrial (steel, pulp and paper, auto manufacturers), chemical manufacturers and refineries, and gas fired electricity generators.

Offering Details

17. In order to participate in the Direct Access offering, customers must:
    - Submit an Energy Efficiency Plan (“EEP”), authored with the assistance of Enbridge Gas Technical Account Managers. The EEP serves as a roadmap allowing customers and Enbridge Gas to actively work together, driving energy efficiency projects at customers’ sites and facilities. Projects identified on the EEP are earmarked for funding.
    - Work with Enbridge Gas Technical Account Managers to quantify and track annual natural gas savings achieved by each completed project.

18. To compel customers to participate in the offering and pursue cost-effective energy conservation opportunities, Enbridge Gas uses a direct access funding model. The direct access budget mechanism grants each customer access to the forecasted incentive budget they pay in rates. In this way, customers know how much funding

they have available each program year, allowing them to appropriately plan expenditures to reduce annual energy usage in their facility.

19. If a customer elects not to submit an EEP or if the direct access budget funds are not fully earmarked or used by a certain date, the unallocated funds are dispersed via an aggregated pool approach. Funds transferred to the Large Volume Aggregate Pool are available to fund additional energy efficiency projects for all other customers eligible for offering on a first-come-first-served approach. This approach is intended to focus the customer on energy efficiency through execution of the EEP and the "use it or lose it" nature of funding model.

Eligibility Criteria

20. 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.

Incentives/Enablers[8]

21. Participants can receive fixed incentives associated with the completion of eligible engineering projects as well as incentives which are commensurate with the Enbridge Gas approved natural gas savings estimates.

22. Incentives associated with eligible engineering projects contemplated at the time of submission include:
    - 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

[8] Incentive details are provided as currently contemplated, Enbridge Gas routinely examines and adjusts incentive amounts in response to opportunities and market conditions, and in an effort to maximize program performance and results over the course of the Multi-Year term.

23. In addition, for new and retrofit equipment, process optimization, and operational improvements, participants can receive:
    - Direct Access Incentive Pool: $0.10/m^3 saved up to the lesser of $100,000 or 50% of project costs, and
    - Aggregate Pool: $0.05/m^3 saved up to the lesser of $40,000 or 50% of project costs.

Metrics

24. The metric for the Direct Access offering is net annual natural gas savings, measured in m^3.

Gross Measurement

25. 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.

Barriers Addressed

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.

Impact Evaluation & Verification

27. Enbridge Gas recommends that third-party verification studies (also known as Custom Project Savings Verification studies, or “CPSV” studies) are appropriate for this offering, since most gross measurement claims are developed by Enbridge Gas. Since Enbridge Gas has been conducting gross measurement claims for several years and has been engaged in the EC’s review of the utility’s gross measurement savings claims, Enbridge Gas submits that multi-year (e.g. every other year) CPSV processes may be more appropriate in an effort to reduce participant survey fatigue and lower evaluation costs.

28. Enbridge Gas submits that Net-to-Gross (“NTG”) studies for this offering, inclusive of both free ridership and spillover elements, need to consider the unique offering design. As a direct access model, participants use their own funding to execute energy efficiency with support from Enbridge Gas. Therefore, traditional NTG approaches may not be appropriate. If NTG studies are conducted, Enbridge Gas submits they should be conducted infrequently, as the offering is not large in terms of the number of customers potentially participating.

Process Evaluation

29. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

DSM PLAN - ENERGY PERFORMANCE PROGRAM

Energy Performance Program

Background

1. The desire to see the implementation of DSM programs that incorporate metered savings results and rely on detailed customer data has been articulated by the OEB as well as several interested stakeholder groups including Building Owners and Managers Association, London Property Management Association, Ontario Sustainable Energy Association and School Energy Coalition ("SEC"). The approach was a topic of discussion in the 2015-2020 DSM Framework mid-term review, and in the OEB's mid-term review report, the OEB concluded: "The OEB encourages the natural gas utilities to begin exploring this concept. This appears to be a good candidate for a pilot program in the post-2020 DSM framework."[1]

2. In light of the interest from stakeholders, there have been various efforts to test an Energy Performance ("EP") approach which applies a metered savings measurement to evaluating energy savings, including:
   - A 2015 pilot with Toronto and Region Conservation Authority ("TRCA") in collaboration with the IESO and local water and electric utilities that applied a utility billing data-driven methodology to support public-sector commercial and institutional buildings in achieving energy savings.
   - A Union Gas Sustainable Schools pilot with TRCA that engaged twenty schools across two school boards to identify, quantify and prioritize all site opportunities via a charette.
   - A Sustainable Schools benchmarking initiative with Climate Challenge Network ("CCN") and the IESO that built off the previous school pilot and included six

[1] EB-2017-0127 / EB-2017-0218, 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.

school boards with five schools per board. Unique to this initiative was the introduction of a Strategic Energy Management workshop to better engage participant schools and share learnings in the process.

- The Run it Right and Runsmart program offerings included in the 2015-2020 DSM Plans targeted operational improvement measures and leveraged metered data to quantify savings.

Lessons Learned

3. Key lessons from these previous EP activities include:
   - Operational programs benefit from the inclusion of benchmarking to ensure high saving potential buildings are identified to justify the resource intensity of these engagements.
   - Ongoing customer engagement is required to influence operational and maintenance practices in order to sustain operational savings.
   - These initiatives naturally lend themselves to gas/electric collaboration; providing a more holistic approach to considering all energy saving opportunities within a facility to maximize the overall benefit of the offering to ratepayers, and allowing for cost savings from an offering delivery perspective.

Whole Building Pay for Performance ("P4P") Offering

4. The proposed Whole Building P4P offering integrates learnings from the earlier EP initiatives by incorporating key engagement elements, while also addressing the incremental technical support needed by participants to achieve deep savings results.

Objective

5. The Whole Building P4P offering applies a holistic, multi-year approach to energy management designed to engage and support customers in driving deeper savings

year-over-year. The offering leverages metered and building data to establish building baselines, set performance targets to achieve 20% above the baseline, and assess all capital, operational and/or behavioural opportunities within a building over a defined period.

Target Market

6. The Whole Building P4P offering will initially target primary and secondary schools with high energy intensity levels relative to other schools, and that meet the eligibility criteria defined below.

7. Schools have been specifically targeted for the introduction of this offering based on, among other things, the homogeneous nature of school building archetypes, which make it appropriate to benchmark one school relative to other schools within a school board. Additionally, stakeholder outreach with school board representatives has also identified this market segment as being highly engaged in seeking opportunities to drive persistent deep savings; however, they are limited in terms of capacity and capability to appropriately identify, quantify, implement, and monitor results. It is therefore expected this segment would be most amenable to this program approach and represent a good entry point for the offering.

8. While the offering will initially target schools, Enbridge Gas will explore the applicability of expanding this offering to other market segments over the course of the Framework.

Offering Details

9. The proposed Whole Building P4P offering is a new EP program that captures metered savings results based on capital, operational and behavioural efficiency measures.

10. The offering targets customers with high energy intensity levels within defined homogeneous market segments (initially primary and secondary schools). In this segment, benchmarking can be reasonably applied, and empowers participants to improve their overall building performance, leveraging the enabling initiatives and performance incentives provided by the offering.

11. Enbridge Energy Solutions Advisors ("ESA") have established long term relationships with customers and will be responsible for engaging with target participants to promote the offering.

12. Enbridge Gas working with a third-party delivery agent will be responsible for supporting the participants to achieve their building performance targets, including development of a baseline model, opportunity identification, implementation, monitoring and reporting.

13. The multi-year engagement of the Whole Building P4P offering can be broken out into three periods, each of which involves a variety of activities as detailed below:
    i. Startup Period
        - Application
            - Customers will be pre-screened based on the eligibility criteria
            - Application form signed with specified 20% performance target goal
        - Baseline Modelling
            - A baseline model will be created using historical consumption data and adjusted for independent variables (i.e. weather, occupancy, etc.).
        - Access to Interval Data
            - Any required meter upgrades will be performed to allow for interval metering and monitoring or customer to provide required access to data from Automatic Meter Reader ("AMR") if already available.

- Opportunity Identification
    - Historical consumption patterns and building data will be analyzed (i.e. via workshop), resulting in the identification and prioritization of opportunities detailed in a summary report provided to the participant.

ii. Pay-for-Performance Periods (Multi-Year – 3 Years)

- Implementation
    - Technical support and guidance available for participants throughout implementation of measures.
- Performance Measurement
    - Incremental savings relative to baseline is determined via metered data (M&V) measured annually.
    - Performance incentive provided if incremental savings are achieved based on M&V results
    - If there are no incremental savings observed, a plan will be developed with the participants to identify the cause and how to achieve savings the following year

iii. Participation Completion

- Bonus Incentive
    - Bonus incentive awarded based on participants' achievement relative to established performance targets.

<u>Barriers Addressed</u>

14. Customer challenges addressed with the Whole Building P4P offering include:

- Benchmarking and energy intensity analysis – provides a means to identify sites with the highest potential for improvement, allowing customers with a portfolio of buildings to focus and target those with high savings potential first.
- Lack of capacity and capability – providing workshops to customers that identify prioritized energy saving activities (behavioural, operational, capital), as well as providing technical support throughout the implementation, monitoring and verification phases.
- Achieving comprehensive savings – Whole Building P4P motivates customers to pursue all opportunities for gas savings (operational, behavioural and capital) concurrently and prioritize high potential savings opportunities. The multi-year nature of the offering and back-end incentives promote continuous improvement by monitoring, measuring and rewarding performance year over year.
- Capturing savings associated with behavioural and/or operational measures – the offering provides an avenue to capture operational improvement measures and behavioural changes that can otherwise be challenging to quantify through engineering calculations alone.

<u>Eligibility Criteria</u>

15. To be eligible for the offering, participants must meet the following criteria:

- Must be an Enbridge Gas Commercial customer. [2]
- The participating building must have existing Enbridge Gas meter that is compatible with pulse interval metering equipment or already has an Automatic Meter Reader (AMR) that allows Enbridge Gas and its approved third-party delivery agent the required access to the building's interval data.

[2] Commercial customers include MURBs, MUSH and other non-industrial businesses.

- The building must have been operational without having undergone any capital retrofit upgrades between the start of the baseline period up to the start of the P4P Period. (Baseline Period and P4P Period are further described in the Gross Measurement section below.)
- Participant sites cannot participate in other commercial offers simultaneously during the duration of the offer (inclusive of Start-Up Period & three P4P Periods).

Incentives/Enablers

Start up Period

16. This offering includes the provision of funds to participants to cover the initial set up costs and enabling initiatives, including any necessary meter upgrades and in-kind technical support for opportunity identification (via workshops).

Pay-for-Performance Period (Multi-Year – 3 years)

17. Participants can earn annual performance incentives through the offering:
    - Performance Incentives @ \$0.30/m^3 will be based on M&V of incremental gas savings at the meter relative to the baseline model and awarded at the end of each Pay-for-Performance Period on an annual basis.

Participation Completion

18. Participants can earn a final bonus incentive upon completion of the final Pay-for-Performance Period:
    - Bonus Incentives @ \$0.20/m^3 will be based on M&V of total gas savings at the meter at the end of the offer term relative to the baseline model. Incentives will be awarded at the end of the offer if the customer has achieved the 20% performance target.

19. It is expected that this incentive structure will encourage participants to achieve their performance target through aspiring for incremental savings year over year.

Metrics

20. The metrics for the Whole Building P4P offering include:
   - Net annual natural gas savings, measured in m^3.
   - Number of participants enrolled in offering.
     - To account for the significant amount of upfront and ongoing effort required by Enbridge Gas throughout each participation period, a participant metric has been applied.

Gross Measurement

21. Annual natural gas savings are calculated based on comparing the Adjusted Baseline Model to Adjusted P4P Period consumption, evaluated at the end of each P4P Period (on an annual basis).

   Annual Gas Savings (m^3) Calculation:

   - Year 1 P4P Annual Gas Savings (m^3) = (BM - P4P1) at or above zero
   - Year 2 P4P Annual Gas Savings (m^3) = [(Lesser of BM or P4P1) - P4P2] at or above zero
   - Year 3 P4P Annual Gas Savings (m^3) = [(Lesser of BM or P4P1 or P4P2) - P4P3] at or above zero

   Where:

      BM is the Adjusted Baseline Model Consumption
      P4P1 is the Adjusted P4P Year 1 Period Consumption
      P4P2 is the Adjusted P4P Year 2 Period Consumption
      P4P 3 is the Adjusted P4P Year 3 Period Consumption

Baseline Model Requirements:

- Baseline Period should have a minimum 12 months of baseline history using utility data or interval data (if already available via customer) and should be based on the most recent 12 months of data. However, alternative Baseline Periods may be accepted if the most recent data is not representative of typical building operation.
- Baseline Model input/output granularity ranges from daily (most granular) to bi-monthly (least granular) intervals.
- Baseline Model should be a regression model that is derived based on metered gas consumption during the Baseline Period and is adjusted for independent variables to allow for adequate representation of the baseline gas consumption during the P4P Period.
- Baseline Model will be approved by Enbridge Gas prior to participant being enrolled into the program offering.
- Baseline Model, once approved, should not change for the balance of the program offering.

P4P Period:

- P4P Period is defined as a maximum 12-month period in which metered gas consumption is measured against the Baseline Model
- P4P period consumption should be adjusted for the same set of independent variables as applied to the baseline model.
- P4P Period data granularity will be at a minimum of daily intervals.

22. An eligible participant is claimed upon completion of the following:
    - Baseline model completed & summarized in report approved by Enbridge Gas
    - Interval meter data active & being collected (daily granularity)
    - Workshop completed with report summarizing site opportunities

- Signed Application Form from customer

Timing

23. Based on the design of this offering and the multi-year nature of the participants' engagement, Enbridge Gas will be required to make future financial commitments related to participants undertaking activities over the course of their participation in the offering. Enbridge Gas proposes to track these Deferred Participant Costs ("DPC") as part of its program accounting in order to allocate and track funds required for future components of the offering. The DPC mechanism is described in the Proposed Framework.[3]

Impact Evaluation & Verification

24. Enbridge Gas recommends limited impact evaluation and verification for this offering in the near term, due to the offerings nascency and scope. Verification could include a review of project files. Increased impact evaluation could be assessed for appropriateness in the longer term.

Process Evaluation

25. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

[3] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 12.2.1.

BUILDING BEYOND CODE PROGRAM

Building Beyond Code Program Strategy

New Construction Market

1. If there is one persistent characteristic that could best reflect both the residential and commercial new construction markets over the past decade it is change. Changes to building codes, designs, technologies, costs, governmental priorities, municipal policies, climate change plans, have all had varying degrees of impacts on builders and customers alike. As Ontario approaches the goals identified in the Pan-Canadian Framework of achieving Net Zero Energy Ready ("NZER") construction as a code requirement in 2030, Enbridge Gas expects that the rate of change will only intensify.

2. The authoring of the Pan-Canadian Framework in 2016 has driven the federal government to actively pursue many of the action items listed therein. In relation to building code advancement in support of the Pan-Canadian Framework's goals, it was identified that "federal, provincial, and territorial governments will work to develop and adopt increasingly stringent model building codes, starting in 2020, with the goal that provinces and territories adopt a "net-zero energy ready" model building code by 2030."[1] This prompted the introduction of a step code to the National Energy Code for Buildings ("NECB"), with each step progressing towards higher efficiency levels until a NZER building standard is achieved. For buildings that fall under Part 3 [2] of the Ontario Building Code ("OBC") (commercial and multi-

[1] Pan-Canadian Framework on Clean Growth and Climate Change – Canada's Plan to Address Climate Change and Grow the Economy, Environment and Climate Change Canada (2016), p. 17. http://publications.gc.ca/collections/collection_2017/eccc/En4-294-2016-eng.pdf
[2] Buildings exceeding 600 m2 in building area or exceeding three stories in building height and used for residential, businesses, mercantile or medium to low hazard industrial occupancies, As defined under Building Code Act, 1992, S.O. 1992, C.23. https://www.ontario.ca/laws/regulation/120332

residential) buildings, it is anticipated that Ontario will adopt Tier 2 of the four-tier NECB step code (approximately 25% above current OBC) beyond 2024, as referenced in Attachment 1, page five of the final report of SeeLine Group Ltd., who conducted an analysis of Commercial New Construction in 2020. For Part 9 (residential and low-rise) buildings[3], a five-tier step code applies, and it is anticipated that Ontario may adopt Step 3 which is approximately 15% above 2017 OBCSB-12.

3. In addition to the introduction of a new step code, municipalities are beginning to create their own Green Development Standards ("GDS") that may align with or exceed the provincial building code performance requirements to address their own specific regional climate and energy efficiency goals. Municipal GDS are in various stages of development and adoption across the Province. The Toronto Green Standards ("TGS"), for example consists of tiers that progress towards the requirement that new building construction standards reach NZER by 2030. Currently, all new buildings constructed in Toronto are required to achieve Tier 1 of the TGS, which roughly equates to 15% better than the energy efficiency requirements in the OBC, (Attachment 1, page 44).

4. The implications of these changes 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. Further, as incremental costs are expected to increase at a disproportionate rate when compared to increased energy efficiency requirements, builders and developers will need to focus even more on finding new and innovative approaches to drive down costs.

---

[3] All buildings of three or fewer stories in building height, having a building area not exceeding 600m2, and used for residential occupancies, businesses, mercantile, or low hazard industrial occupancies. As defined under Building Code Act, 1992, S.O. 1992, C. 23. https://www.ontario.ca/laws/regulation/120332

5. 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 forthcoming higher efficiency standards.

Barriers

6. Although there are a variety of distinct nuances and challenges particular to Part 3 versus Part 9 new construction, the following primary market barriers impacting the adoption of high-performance building practices and measures are common to both markets.

7. Cost and Resource Constraints – It takes time and money to engage a design team in exploring and modelling different building designs to achieve a higher efficiency performance. Furthermore, there are the incremental costs involved with the procurement, installation and implementation of measures associated with building to higher-efficiency building performance standards.
   Enbridge Gas will continue to address these barriers by:
   - Delivering offerings with incentives that fund key elements associated with the adoption of high-performance modelling, measurement and/or technologies.
   - Minimizing time and resource requirements associated with participating in offerings.

8. Challenges with interpreting the OBC and evolving regional GDS approaches - Industry practitioners commonly agree that interpreting the OBC can be resource intensive, and the potential challenge of having to navigate various GDS in different municipalities presents additional interpretation hurdles. Enbridge Gas will continue to address these barriers by:
   - Hosting workshops/webinars to educate the new construction community on changes in codes and standards.

- Providing workshop participants with a clear understanding of the offering's energy efficiency requirements relative to relevant codes, standards and GDS requirements.

9. Limited knowledge of opportunities and sourcing credible experts – As codes and standards progress to higher efficiency levels, builders will need to explore new measures and alternate design models to reach higher efficiency standards. Enbridge Gas will continue to address these barriers by:
   - Developing case studies that profile industry best practices towards the achievement of higher performance buildings.
   - Leveraging a network of credible experts to support builders in identifying, modelling, and implementing efficiency measures that will result in the achievement of high-performance buildings.

10. Making the business case for investing in high-performance building design – It is difficult to justify the incremental costs associated with high-performance building without understanding the benefits that will be realized in terms of energy savings over time. Enbridge Gas will continue to address these barriers by:
    - Developing and sharing case studies and Integrated Design Process ("IDP") reports / technical white papers that articulate the costs and benefits associated with implementing high-performance design and building measures.

Building Beyond Code Program Offerings

11. It can take many years for a new construction project to advance from design to completion. For example, Part 9 building projects typically take anywhere from one to three years, and Part 3 buildings can take upwards of five years until completion. Furthermore, each stage in the new construction process involves different market actors. For instance, the pre-construction team will primarily consist of a design team

which typically includes the project owner/builder/developer as well as the architects, building scientists and engineering firms involved in the design, modelling and permitting of the project. During the construction phase it is the responsibility of the construction team to properly install and build the building to meet the design specifications. Finally, during the post-construction phase prior to occupancy, building energy consultants can be engaged to perform commissioning and/or air tightness testing to verify that the project is performing as intended.

12. Key decisions impacting overall building performance such as enclosure, orientation and core systems are typically made at the design stage of a project, which is why the majority of the proposed Building Beyond Code program offerings focus on influencing change at this phase.

13. The new construction market is regulated by codes and standards driven at a federal (National Energy Code for Buildings), Provincial (Ontario Building Code) and Municipal (Permitting and Green Development Standards) level. Advancements to codes and standards are anticipated to occur in the coming years that will significantly change the new construction market landscape.

14. Enbridge Gas's proposed Building Beyond Code program offerings are comprised of both a continuation of existing offerings and the introduction of new offerings designed to prepare and support the progress of the new construction market towards future advancements in codes and standards. These offerings cater to new developments that are regulated under the OBC, and address three distinct markets: residential single family dwellings, commercial buildings (non-industrial businesses, MUSH and MURB), and affordable housing single and multi family dwellings.

15. A variety of inputs were considered in the development of the proposed Building Beyond Code program offerings associated with the Multi-Year plan, including:

- The objectives outlined in the OEB's December 1, 2020 letter (EB-2019-0003);
- The guiding principles outlined in Enbridge Gas's Proposed Framework;
- Lessons learned by Enbridge Gas while delivering offerings, some of which were first introduced in 2012;
- Feedback from stakeholders received through the course of the 2015-2020 Multi-Year DSM Plan and the 2021 DSM Plan proceedings; and
- Changes in the new construction landscape, informed by commissioned research, as the market progresses towards net zero energy ready (NZER) building, found in Attachments 1 and 2.

16. The Building Beyond Code Program is proposed in the DSM Plan with its own independent scorecard. The scorecard and targets to assess performance for this program are detailed in Exhibit D, Tab 1, Schedule 2. The budget for the Building Beyond Code Program is provided in Exhibit D, Tab 1, Schedule 1.

17. The proposed Building Beyond Code program includes four forward looking offerings. The three proposed Savings by Design ("SBD") offerings are evolutions of prior offerings that both motivate builders to pursue and reduce lost opportunities; and support builders/developers and their design teams through an IDP. Although each of the SBD offerings has unique elements to address the specific needs of their target market, the following enabling elements are consistently applied across all SBD offerings:

    - Visioning Session – Participant's design team meets with an offering facilitator to discuss and define project requirements and priorities to incorporate as part of the IDP workshop.

- IDP Workshop – This collaborative workshop 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. The workshop will incorporate live modelling to demonstrate impacts of various design options. Topics discussed during the workshop may include, but are not limited to the following:
    - Siting and orientation
    - Building envelope and fenestration
    - Optimization of passive solar, day lighting and natural ventilation
    - Construction materials
    - Mechanical systems and controls analysis
    - Reduction and optimization of internal energy loads
    - High efficiency lighting systems and occupancy sensors
    - Water conservation and storm water management strategies

- Project Design Report – Summary of the findings of the workshop and associated energy modelling will be prepared and provided to the participant. The report highlights energy efficiency design choices and their respective energy savings potential, and to the extent possible, addresses incremental costs and operating cost savings associated with the design options discussed in the workshop.

18. In addition to the proposed SBD offerings, a new Commercial Air Tightness Testing offering has been proposed to address market barriers to the adoption of air tightness testing standards for Part 3 buildings.

19. Table 1 below provides a high-level summary of the four Building Beyond Code program offerings proposed:

Table 1

Offering Name	High Level Description	Key Offering Elements
Residential Savings by Design	Focused on limiting lost opportunities in new construction part 9 builds and supports the builder community in striving to design and build to a net zero energy ready standard.	• Technical Assistance: - Visioning Session - Energy Modelling Support - IDP Workshop and Final Report - Access to Subject Matter Experts • Training/Education • Marketing/Communication Support • Financial Incentives
Commercial Savings by Design	Prepares the commercial building community for future code advancements through a combination of support initiatives to increase the number of buildings designed to achieve 25% above the existing Ontario Building Code.	• Technical Assistance - Visioning Session - Energy Modelling Support - IDP Workshop and final report - Access to SMEs
Affordable Housing Savings by Design	Enables and supports affordable housing providers to design and construct affordable housing projects with better energy performance than required by the Ontario Building Code.	• Technical Assistance: - Visioning Session - Energy Modelling Support - IDP Workshop and Final Report - Access to SMEs • Training/Education • Marketing/Communication Support • Financial Incentives

Commercial Air Tightness Testing	Advances the adoption of air tightness testing among commercial new construction buildings to support the integration of air tightness testing requirements in future code updates.	• Education/Awareness • Training/Capacity building • Financial Incentives

<u>OEB Objectives and Guiding Principles</u>

20. Building Beyond Code program offerings have been designed to achieve the OEB's primary and secondary objectives. While the incentives are predominantly provided to builders, the final outcome is that the eventual occupant/owner/tenant will experience lower energy bills and natural gas usage as a result. This in turn will help reduce GHG's in support of meeting Ontario's greenhouse gas reduction goals.

21. These offerings also satisfy many of the guiding principles[4] listed in the Proposed Framework, including:
    - DSM plans should minimize lost opportunities for energy efficiency and should be designed to pursue long term energy savings.
        - A significant aim of these offerings is to ensure feasible energy efficiency opportunities are fully explored and considered at the earliest possible stage when they can be undertaken more cost-effectively than post-construction and persist for the long term.
    - DSM plans should support innovation, technology development and adoption of lower-carbon alternatives to enable longer term energy efficiency and conservation opportunities for consumers, consistent with the advancement of government policy goals.

[4] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, pp. 5-8.

  - Building Beyond Code offerings aim to advance adoption of measures and practices that drive above code performance in an effort to advance the adoption of higher efficient standards and support the movement towards a NZER code.
- DSM plans should ensure that small volume, low-income and on-reserve First Nations communities are well-served.
  - An affordable housing offering has been created to address the unique challenges of that market.
- DSM plans should include strategies to increase the natural gas savings by targeting key segments of the market and/or customers with significant room for efficiency improvements.
  - Offerings target builders at a time where key decisions can be made that can significantly improve the overall efficiency and performance of buildings.

Residential Savings by Design Offering

<u>Background</u>

22. Since 2012, EGD and Union had each supported high-performance residential new construction through their respective program offerings - Savings by Design and Optimum Home. SBD focused on assisting builders in advancing their building designs through an IDP and the provision of incentives for completed homes, creating multi-year commitments that were dependent on housing completions. The objective was to support builders in their efforts to design and build to 15% above the building code of the time.

23. Similarly, Optimum Home ("OH") focused on assisting and motivating builders towards more efficient building design and construction through a multi-year / multi-phased approach. However, instead of providing a per home incentive, a greater

focus was on providing trades / sales training and technical support towards the development of a discovery home built to the ENERGY STAR® for New Homes standard.

24. As code advanced throughout the previous framework from the 2012 code to the 2017 code, the offerings evolved to address new challenges presented in continuing to pursue even higher levels of energy efficiency.

25. As in the past, market conditions are continuing to change, and lessons learned from delivery of the previous program offerings, and engagement with industry experts have informed the new direction of the proposed Savings by Design program offering for this Multi-Year Plan.

Objective

26. The Residential Savings by Design program offering is intended to both motivate the builder community to limit lost opportunities along two paths: 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.

Target Market

27. For the ESNH or equivalent standard path, Enbridge Gas's focus will be on engaging builders in municipalities that have previously demonstrated low levels of penetration for homes built to these efficiency standards.

28. For the NZER discovery home path, Enbridge Gas will focus on engaging forward thinking builders across its franchise territory interested in learning and taking on the challenge of designing and building a NZER discovery home.

Offering Details

29. There are two paths forward to participation in the program offering as outlined below and builders can participate in either or both should they meet the required conditions for each path. A combination of internal sales resources and external third-party partners will be leveraged to promote and deliver this program offering.

a) ENERGY STAR for New Homes[5] ("ESNH") or Equivalent Path

30. The ESNH or equivalent path will focus on limiting lost opportunities by motivating builders building in eligible municipalities to construct new homes to at least ESNH Version 17 or modelled equivalent performance (at least 20% better than OBC SB12 2017).

31. Builders can participate in workshops that provide technical guidance on building to the ESNH standard and an overview of the participation requirements. Those that choose to participate in the ESNH path will be eligible for an incentive of up to $1,650 per home that meets the eligibility criteria as outlined above. 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.

b) NZER Discovery Home Path

32. The NZER discovery home path will focus on working with builders on a one-to-one basis, through combining aspects of the previous SBD Residential and Optimum Home offerings. The new offering will consider new technologies and approaches to energy efficient construction and will assist builders to design and build one discovery home to a NZER standard.

[5] The ENERGY STAR® name and the ENERGY STAR® symbol are registered trademarks of the United States Environmental Protection Agency.

33. Participants will be guided through a series of activities to support the design and construction of the NZER discovery home, including:
    - Visioning session between the design team and IDP workshop facilitator
    - IDP workshop followed by an IDP workshop report that summarizes key outcomes for the design team.
    - Associated trades training to ensure implementation meets designed outcomes
    - NZER 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.
    - NZER evaluation incentive of $1,500 to assess whether the discovery home achieved the NZER standards.

<u>Eligibility Criteria</u>

a) ESNH or equivalent path

34. Homes must be built in eligible municipalities, defined as municipalities within the Enbridge Gas franchise area that have historic 3-year penetration levels of ESNH builds not more than 15%, updated as described below.

35. 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"). Once a municipality has been deemed to be eligible to participate in the offering, it will remain eligible for at least the first three-year period of the offering. The reason for this is that once engaged, builders tend to plan on a multi-year basis, and if the offering is to attract significant interest it needs to operate in alignment with existing builder planning practices.

36. The only instance where a municipality that qualified to be included in the ESNH Report would be removed is if they were to adopt a GDS that mandates ESNH or

similar equivalent performance standards for new residential builds in that municipality.

37. Builders eligible to participate are those building new residential homes in eligible municipalities as defined above. Residential homes built by participating builders in eligible municipalities are required to use natural gas as a primary fuel source for space and/or water heating and must be located within the Enbridge Gas franchise area.

38. Affordable housing projects are excluded from participating in this offering based on their ability to participate in the Affordable Housing Savings By Design offering which aims to support affordable housing projects directly.

b) NZER discovery home path

39. Any builder building within the Enbridge Gas franchise territory that has not previously participated in the NZER discovery home path is eligible to participate.

40. 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.

41. Project must be in the design phase or earlier in the development process to qualify.

42. Affordable housing projects are excluded from participating in this offering based on their ability to participate in the Affordable Housing Savings By Design offering which aims to support affordable housing projects directly.

Metrics

a) *ESNH or equivalent path*

43. The number of homes built by participating builders in eligible municipalities to the ESNH or modelled equivalent level of energy efficiency (at least 20% better than 2017 OBC).

44. In order to provide an incentive to the participating builder and count the constructed home towards the ESNH homes built metric, Enbridge Gas will require label certification and/or energy modelling results to confirm that energy efficiency performance levels reach or exceed the ESNH standard or modelled equivalent (minimum 20% better than code).

b) *NZER Discovery Home path*

45. The number of homes built by participating builders to the NZER standard as defined by the Canadian Home Builders' Association ("CHBA") Net Zero Labelling program.

46. In order to provide an incentive to the participating builder and count the constructed home towards the NZER homes built metric, Enbridge Gas will require label certification and/or energy modelling results that confirm energy efficiency performance in line with the CHBA Net Zero Labelling program.

Timing

47. Due to the nature of new construction projects, there will be a time lag between completing the IDP Workshops in the design phase and completing construction on the project. Enbridge Gas proposes to use the Deferred Participant Cost ("DPC") mechanism to track financial commitments made to account for future participant

obligations in the DSMVA so that funds are available in future years for when they are needed. The DPC is described in the Proposed Framework.[6]

<u>Impact Evaluation & Verification</u>

48. Enbridge Gas recommends impact evaluation focus on the offering objective of avoiding lost opportunities in the new construction market. Verification should focus on ensuring homes built met the eligibility criteria for the ESNH offering and builders met the eligibility criteria for the NZER offering.

<u>Process Evaluation</u>

49. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Commercial Savings by Design Offering

<u>Background</u>

50. The proposed Commercial Savings by Design offering is an evolution of the offering first introduced in 2012 by EGD. Commercial Savings by Design supports builders and developers through an IDP so that they may achieve building designs with higher energy performance than those required by the existing OBC.

51. The offering has been well received by previous participants as demonstrated in a qualitative research study of Enbridge Gas commercial customers conducted by Ipsos in 2020 where Savings by Design was mentioned unaided several times as “an invaluable program….it makes logical sense to consider energy efficiency from

---

[6] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 12.2.1.

the onset in the original building design as opposed to trying to find opportunities after the property has been built."[7]

52. Through delivering this offering over the previous eight years Enbridge Gas has learned a number of lessons which have helped to inform future design changes.

53. In order for a building to be eligible under the old program offering criteria, it needed to be at least 50,000 square feet. This significantly limited the pool of participants both from a building type and a geographic perspective.

54. The long timelines between IDP and the final build led to many participants not choosing to complete the requirements to access the final stage incentives.

55. As national codes and municipal standards impacting the new construction market are anticipated to progress to higher efficiency levels over the coming years, the building community will need to begin to adapt in order to address the expected incremental costs[8] and familiarize themselves with the unconventional design elements that will be required to reach these higher standards (Attachment 1, Section 6). These forthcoming challenges will make the technical services provided through the Commercial Savings by Design offering increasingly important in supporting this movement towards NZER building.

Objective

56. The objective of Commercial SBD is to prepare the building community for future code advancements, and avoid lost opportunities associated with decisions made at

---

[7] Enbridge Gas Commercial Next Gen DSM Planning - Stakeholder Engagement: Report of Qualitative Research Findings, Ipsos (October 2020), p.68, filed at EB-2021-0002, Application, Exhibit 4, Tab 1, Schedule 4, Attachment 1.
[8] The Evaluation and Costing of the Proposed ENERGY STAR for New Multi-Family Buildings - Program for Ontario, Sustainable Buildings Canada (April 11, 2018). https://sbcanada.org/wp-content/uploads/2018/06/ESMFB-Modelling-Project-Report.pdf

the design phase (i.e. orientation, envelope, etc.), through a combination of technical, educational and enabling support initiatives to increase the number of buildings designed to achieve at least 25% increased energy efficiency performance above the existing OBC (SB-10).[9]

Target Market

57. Commercial SBD is targeted to commercial and multi-residential builders, subject to eligibility details outlined below.

Offering Details

58. Commercial SBD will be delivered to builders and developers by Enbridge Energy Solutions Advisors (ESAs) who will engage with municipalities, trade associations and key accounts to identify eligible new construction buildings.
Participants will be guided through a series of activities to support the adoption of higher efficiency building designs, including:

- Visioning Session between the design team and IDP workshop facilitator;
- Energy Modelling to create a baseline energy model to use during the IDP workshop and help set the IDP Efficiency Target, details included below under IDP Efficiency Targets;
- IDP Workshop followed by an IDP workshop report that summarizes key outcomes for the design team;
- Assessment of final design submitted for permitting to determine if the final design is anticipated to achieve the IDP efficiency performance target; and
- Post building participant survey to assess the impact the IDP workshop had on the final design, with feedback from the survey leveraged to support continuous improvement of the program offering.

[9] CSBD efficiency targets will be based on the achievement of Thermal Energy Demand Intensity (TEDI) and Total Energy Use Intensity (TEUI) efficiency levels consistent with the achievement of 25% above OBC SB-10.

59. Facilitation of IDP workshops and final design assessment will be conducted through contracted third-party delivery agents.

60. In order to broaden the reach of the offering, Enbridge Gas is proposing a reduction in minimum square footage required for buildings to participate from 50,000 sq. ft. to 25,000 sq. ft. This should allow for not only a greater variety of building types to participate, but over a greater portion of the Enbridge Gas franchise territory.

61. Additionally, as it relates to the time to build challenges with the earlier offering, Enbridge Gas has decided to shift its focus to mandating that builders supply the energy models that are submitted for permitting purposes to the respective municipalities to Enbridge Gas for review. While not required to be counted as participants, these models will help inform Enbridge Gas as to the decisions that were made by the builders following the completion of the IDP and help inform any potential future program design improvements.

IDP Efficiency Targets

62. IDP efficiency performance targets will reflect the achievement of Thermal Energy Demand Intensity (“TEDI”) and Total Energy Use Intensity (“TEUI”) levels that result in the achievement of 25% above existing OBC, SB-10. Toronto’s Green Development Standards, known as Toronto Green Standards (“TGS”), for commercial and mid-to high rise residential buildings has established TEDI and TEUI levels consistent with the achievement of 25% above code and will be leveraged as a basis for setting TEDI and TEUI targets. [10]

[10] Tier 2 of the TGS Version 3 for commercial and multi-residential buildings references TEDI and TEUI levels consistent with 25% above code. https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/toronto-green-standard-version-3/mid-to-high-rise-residential-all-non-residential-version-3/energy-ghg-resilience-for-mid-to-high-rise-residential-all-non-residential-development/

63. It is anticipated that the City of Toronto will advance their TGS sometime within the plan term. If and/or when this occurs, Enbridge Gas will adjust efficiency targets exclusively for the City of Toronto to achieve 10% above TGS minimum performance requirements. Efficiency targets for all other cities across Ontario will remain unchanged at 25% above code, unless the city has a Green Development Standard in place that requires the achievement equivalent to or above 25% above code, in which case, a target of 10% above the city's required efficiency performance level would be applied.

64. In the case a participant's baseline design prior to the IDP workshop is above code and/or any mandatory efficiency level set by the municipality, a target to achieve the higher of 10% above the baseline or 25% above code will be set. For example, if the baseline building achieves a 20% above code efficiency level, the target efficiency level for the customer will be the achievement of at least 30% above code. Conversely, if the baseline building achieves a 10% above code efficiency level, the standard 25% above code Commercial Savings by Design IDP target will stand.

<u>Eligibility Criteria</u>

65. Eligible buildings must meet the following criteria:

- Project must commit to plan to use natural gas as a fuel source for space and/or water heating
- Commercial or multi-residential building to be built subject to OBC Part 3, Part 10 or Part 11 building types[11]

[11] Ontario Building Code Part 3 (mid and high-rise buildings), Part 9 (single family and low-rise multi-family buildings), Part 10 (existing buildings undergoing a change of use), or Part 11 (existing buildings undergoing a major renovation). https://www.ontario.ca/laws/regulation/120332

- Affordable Housing projects are excluded from participating in this program offering based on their ability to participate in the Affordable Housing New Construction program offering which targets these projects
- Building must be in the design phase or earlier in the development process to qualify for consideration
- Minimum threshold of 25,000 square feet contemplated per building as per application form

Metrics

66. The number of participants who complete the IDP workshop and receive the Commercial Savings by Design report.

Timing

67. Due to the nature of new construction projects, there will be a time lag between completing the IDP Workshops in the design phase and submission of the final design for permitting. Enbridge Gas proposes to use the Deferred Participant Cost ("DPC") mechanism to track financial commitments made to account for future participant obligations in the DSMVA so that funds are available in future years for when they are needed. The DPC is described in the Proposed Framework.[12]

Impact Evaluation & Verification

68. Enbridge Gas recommends impact evaluation focus on the offering objective of educating participants. Verification could include ensuring program participants met the eligibility criteria.

Process Evaluation

69. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to

[12] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 12.2.1.

program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Affordable Housing Savings by Design Offering

Background

70. Since its introduction to the market in 2016, the Affordable Housing Saving by Design offering has been focused on influencing affordable housing new construction projects to adopt higher efficiency designs through the use of an IDP workshop and the provision of energy performance incentives at the time of construction.

71. Enhancements to the proposed Affordable Housing offering have been made to reflect feedback from participants and in consideration of the anticipated national and municipal trend towards higher efficiency standards.

72. Feedback from participants focused on overcoming financial barriers and has been addressed in the new proposed offering in two ways. First, by providing participants with energy modelling results relative to the NECB in an effort to support the participant's application requirements for government funding programs. Second, the incentive structure has been modified to allow participants to earn performance incentives earlier in the construction process and therefore supporting the up-front incremental costs of investing in higher energy efficiency in new construction.

73. The proposed Affordable Housing SBD offering supports participants' efforts in achieving higher energy performance design targets. With anticipated increases in building energy efficiency requirements and higher performance expectations from municipalities for new affordable housing projects, this is an increasingly important

market need as the market progresses towards Net Zero Energy Ready building standards.

Objective

74. The objective of the Affordable Housing SBD offering is to support affordable housing providers to design and construct projects that achieve at least 20% increased energy efficiency performance above the existing OBC. The offering also avoids lost opportunities associated with decisions made at the design phase (i.e. orientation, envelope, etc.), through a combination of technical, educational, and enabling support initiatives.

Target Market

75. The offering is targeted to new construction affordable housing single family and multi-residential projects, subject to eligibility details outlined below.

Offering Details

76. Affordable Housing SBD will be delivered to customers through an internal sales team who will leverage relationships developed with various stakeholders in the affordable housing and design communities, including municipal social housing providers, non-profit housing providers, and assisted housing providers, to identify eligible projects.

77. Participants will be guided through a series of activities to support the adoption of higher efficient building designs, including:

- Visioning Session between the design team and IDP workshop facilitator.
- Energy Modelling to create a baseline energy model to use during the IDP workshop and help set the energy performance target - details as outlined below under energy performance targets.

- IDP Workshop followed by an IDP workshop report that summarizes key outcomes for the design team.
- Technical assistance incentive of up to $7,500 is provided to participants following completion of the IDP workshop to offset consulting fees incurred because of design team member attendance.
- Energy performance Incentive of $1,000 per affordable housing unit, to a maximum of $120,000 per project is provided to participants whose project designs meet the IDP Efficiency Target. 50% of the incentive is payable at the time of the building permit application, based on the energy performance of the design submitted for permit, and the remaining 50% is payable upon completion of construction, based on the energy performance of the as-built energy model.

78. Facilitation of IDP workshops and verification of energy performance of project designs at the permit and post-construction stages will be conducted through contracted third-party delivery agents.

Energy Performance Targets

79. The energy performance targets will reflect the achievement of at least 20% better energy efficiency than required by the 2017 OBC.

80. In the case that a project will be constructed in a municipality that imposes a GDS requiring the achievement equal to or above 20% better than OBC, an incremental performance target of 5% above the respective GDS target would be applied.

81. In the case a participant's baseline design prior to the IDP workshop is above code and/or any mandatory efficiency level set by the municipality, a performance target equivalent to the higher of 5% above the baseline or 20% above code will be set. For example, if the baseline project already achieves a 20% above code efficiency level, the target efficiency level for the participant will be the achievement of at least

25% above code. Conversely, if the baseline project already achieves a 10% above code efficiency level, the standard 20% above code Savings by Design Affordable Housing IDP target will stand.

Eligibility Criteria

82. Eligible projects must meet the following criteria:

- Projects must commit to plan to use natural gas as a primary fuel source for space and/or water heating
- New construction housing and multi-residential projects to be built subject to OBC Part 3, Part 9, Part 10, or Part 11[13]
- Project construction intended to be completed within five years of signing the application form for multi-family projects, or within three years of signing the application form for single family projects
- Must be in the design phase or earlier in the development process
- Projects must qualify as Affordable Housing, by virtue of falling under one of the following classifications: Housing being built by Social Housing Providers as defined below:

  Social and Assisted Housing, for the purposes of DSM programming includes:

  - Non-profit providers of social or assisted housing under a federal, provincial or municipally funded program, and includes, without limitation, non-profit corporations governed by the Housing Services Act, 2011 (as amended or any successor legislation);
  - Public housing corporations owned by municipalities directly or through local housing corporations;

[13] Ontario Building Code Part 3 (mid and high-rise multi-family buildings), Part 9 (single family and low-rise multi-family buildings), Part 10 (existing buildings being converted into affordable housing by undergoing a change of use), or Part 11 (existing buildings undergoing a major renovation).

- Non-profit housing co-operatives as defined in the Co-operative Corporations Act;
- Non-profit housing corporations that manage or own residential (including multi-residential) buildings developed under the "Affordable Housing program"; and
- Non-profit organizations, or municipal or provincial governments that manage or own residential (including multi-residential) supportive housing, shelters and hostels.

OR

Privately-owned multi-residential housing where the applicant has declared that at least 30% of units are intended to be affordable.

<u>Metrics</u>

83. Number of participants who complete the IDP workshop and receive the Affordable Housing SBD report.

<u>Timing</u>

84. Due to the nature of new construction projects, there will be a time lag between completing the IDP Workshops in the design phase and completing construction on the project. Enbridge Gas proposes to use the DPC mechanism to track financial commitments made to account for future participant obligations in the DSMVA so that funds are available in future years for when they are needed. The DPC is described in the Proposed Framework.[14]

---

[14] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 12.2.1.

Impact Evaluation & Verification

85. Enbridge Gas recommends impact evaluation focus on the offering objective of educating participants. Verification could include ensuring program participants met the eligibility criteria.

Process Evaluation

86. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Commercial Air Tightness Testing Offering

Background

87. Air sealing is commonly understood to present a sizeable energy savings potential, however without air tightness testing, even the best building envelope design on paper can fall short of the desired performance due to construction errors.[15]

88. Building air tightness testing requirements were initially proposed to be introduced as part of Canada's 2020 NECB. The proposal was based on the results of 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.[16] Although proposed, the requirements for building air tightness testing were resisted by the

[15] A Field Study of Exterior Airtightness Testing in Five Multi-Unit Residential Buildings, Gray, Jason (2018), page 1. https://tspace.library.utoronto.ca/handle/1807/91731
[16] Canada wavers on airtightness testing – Proposed change to National Energy Code has been withdrawn, Canadian Property Management, Carss, Barbara (June 9, 2020). https://www.reminetwork.com/articles/canada-wavers-on-airtightness-testing/

Provincial/Territorial Policy Advisory Committee on Codes ("PTPACC") and subsequently withdrawn from the 2020 NECB.

89. Unfortunately, unless mandated as a compliance requirement, air tightness testing is very uncommon for commercial and multi-residential buildings in Ontario (Attachment 1, page 34). The most predominant challenges associated with market adoption of building air tightness testing include capacity challenges and perceived risks. Although air tightness testing is commonly performed in single family homes, there is currently a limited number of practitioners with the knowledge, capability and equipment to perform commercial building air tightness testing, this is especially the case for mid to high-rise buildings, where several blower door fans are required. Furthermore, because air tightness tests are typically performed after the building enclosure has been constructed, there is perceived risk associated with not being able to cost-effectively resolve any performance issues identified through testing.

90. Despite these market challenges and the resulting omission of air tightness testing requirements in the 2020 NECB, the November 2020 Office of the Auditor General of Ontario Report recommended that "the Ministry of Municipal Affairs and Housing establish and implement processes and requirements, such as air tightness testing and update key performance indicators that evaluate and verify the efficacy of OBC's energy-efficiency requirements".[17] Given the interest expressed by different levels of government in this testing and in recognition of the need for advancing air tightness testing, Enbridge Gas sees a significant opportunity in proposing this program offering.

91. Enbridge Gas's experience in working with builders in exploring new and innovative design and construction approaches through the delivery of its Commercial Savings

[17] Value-for-Money-Audit: Reducing Greenhouse Gas Emissions from Energy Use in Buildings, Office of the Auditor General of Ontario (November 2020), Recommendation 6, p. 23.

by Design offering ideally positions it to actively work with stakeholders in the new construction market to identify and begin to break down barriers to this process becoming more standardized and potentially formalized through future code updates.

Objective

92. The goal of the Commercial Air Tightness Testing offering is to advance the adoption of air tightness testing in commercial and multi-family new construction buildings by providing technical and financial support mechanisms to assist customers in commissioning air tightness tests, addressing performance deficiencies, and measuring improved performance levels.

93. Additionally, the offering will seek to build the capacity of commercial air tightness testing agents through the development of standard commercial air tightness testing requirements and the creation and delivery of training workshops.

Target Market

94. The Commercial Air Tightness Testing offering targets both, participants to support the adoption of air tightness testing in buildings, as well as qualified agents in an effort to build capacity for building air tightness testing to facilitate broader market adoption. In terms of participants, the offering targets pre-construction commercial and multi-residential buildings, subject to eligibility details outlined below. Qualified agents targeted for the offering include engineering firms and building scientists.

Offering Details

95. The Commercial Air Tightness Testing offering will support the new construction commercial community in adopting air tightness testing practices at crucial points in the pre-commissioning phase when air tightness can be measured and deficiencies in building envelope performance can be addressed that would otherwise have

resulted in lower performance buildings and incremental energy consumption and costs to customers over the lifetime of the building. The Air Tightness Testing offering will be delivered through a third-party delivery agent in coordination with internal Enbridge ESAs working collaboratively to identify, secure, and shepherd participants through the offering. The elements of this offering will address three primary barriers:

i) *Limited awareness of benefits of air tightness testing*. Because air tightness testing is not common practice for commercial buildings, there is little knowledge of the discrepancies between modelled air tightness and constructed air tightness. This offering aims to educate the market on the importance of testing the building enclosure to ensure that it is performing to design specifications by leveraging municipal and association networks to educate the market through workshops, case studies and white papers outlining key areas where discrepancies are typically discovered between built and designed air tightness levels, and the overall implications on building performance.

ii) *Capacity challenges* – There are currently a limited number of practitioners with the knowledge, capability, and motivation to perform building air tightness testing. The Commercial Air Tightness Testing offering will help overcome these barriers by:

- Working with third-party experts to develop and articulate standard air tightness testing practices
- Hosting training workshops and profiling case studies to grow market knowledge of best practices
- Actively promoting qualified air tightness testing contractors through the offering to drive practitioner interest
- Providing an incentive structure that motivates customers to actively engage in air tightness testing, creating demand for the service

iii) *Economic challenges and perceived risks associated with poor performance results*. Because air tightness testing is not a requirement, it represents an incremental cost to builders and customers. Additionally, air tightness tests are typically performed after the building enclosure has been constructed, at which point resolving performance issues may be costly and time consuming, making customers reluctant to want to perform the test. This will be overcome predominantly by providing financial incentives to offset:
- Upfront costs associated with air tightness testing along with the proper documentation and reporting on deficiencies and opportunities for improvement
- Implementation of measures to address deficiencies
- Re-testing once improvements have been undertaken

<u>Incentives/Enablers</u>

96. There are two types of incentives available for participants: incentives for the performance of air tightness testing and implementation incentives.

Air Tightness Testing Incentives[18]:

- $0.50 per square foot to a maximum of $30,000 per project.
- Not to exceed 80% of the cost associated with the commissioning of air tightness testing and final report.

Incentives will be paid upon submission of final air tightness testing report.

[18] Proposed incentives are subject to change based on market need.

Implementation Incentives:

- Incentives to cover up to 50% of the cost to a maximum of $15,000 per site for implementation measures to improve overall building envelope performance, such as AeroBarrier, caulking and sealing.

Eligibility Criteria

97. To be eligible for the Commercial Air Tightness Testing offering, participants must meet the following criteria:
    - Commit to plan to use natural gas as a fuel source for space and/or water heating
    - Commercial or multi-residential projects to be built subject to OBC Part 3, Part 10 or Part 11 building types
    - Project enclosure must be in a state to perform air tightness testing by Q3 of 2023
    - Minimum threshold of 25,000 square feet contemplated per project as per application form

Metrics

98. i. The number of participants who implement air tightness testing after they have submitted a copy of their air tightness test final report.
    ii. The number of qualified air tightness testing practitioners recruited and trained through the offering.

Timing Considerations

99. It is assumed that it will take time to ramp up the offering, and costs in 2022 will likely be primarily focused on onboarding the contracted delivery agent who will develop air tightness standards and the materials to support workshops.

Impact Evaluation & Verification

100. Enbridge Gas recommends impact evaluation focus on the offering objective of enrolling participants and increasing the number of practitioners. Verification could include ensuring program participants met the eligibility criteria.

Process Evaluation

101. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

COMMERCIAL NEW CONSTRUCTION

ENERGY CONSERVATION MARKET AND TECHNOLOGIES

FINAL REPORT

for

Enbridge Gas Inc.

August 28, 2020

SeeLine Group Ltd

33 Longboat Ave
Toronto, ON,

Phone: 416.918.2346
Email: mike-singleton@rogers.com

Foreward

SeeLine Group Ltd ("SLG") is pleased to provide the findings of the research undertaken in support of Enbridge's New Commercial Construction, Energy Conservation Market and Technologies assessment. The Report relied on a combination of primary and secondary research where the primary research involved interviews with key sector stakeholders. Secondary research included a review of the Savings by Design results, technology scans and detailed energy modelling aimed at identifying technology solutions that would meet the increasing standards envisioned by the new National Energy Code for Buildings (NECB).

The SLG team consisted of Leslie Kulperger (Project Manager), Michael Singleton and Larry Brydon. SeeLine interviewed 15 individuals as part of the project and was also guided by insights from a number of building science experts and energy modelers. SLG would like to thank all those who participated in the project and provided their invaluable insights. Any errors or omissions are SLG's responsibility.

These are extraordinary times and the full impact of the COVID-19 pandemic is unknown. Where possible we have attempted to identify related issues that might affect the commercial buildings sector and new construction in particular.

Table of Contents

Executive Summary

Commercial buildings are complex, and the variability of municipal standards incremental to the OBC adds another layer of complexity to designing and constructing new buildings. Based on both primary and secondary research, this report provides a strategic overview of Ontario's Commercial New Construction market and, in particular, how anticipated code changes and municipal green standards may impact natural gas usage over the next five years, whether the market has the knowledge and capacity to meet the changes, and what likely technologies or solutions could be pertinent to supporting advanced efficiency and carbon targets.

Key highlights include:

- Anticipate "NECB 2020" will not be released until 2021, and associated OBC changes would come into effect in 2023.
    - Proposed changes are not finalized, and analysis in this report uses NECB 2017 as the reference case based on the analysis conducted through the National Research Council of Canada's committees.
    - Ontario's adoption of NECB could impact other requirements and standards; for example, the commercial boiler standards for commercial new construction require 90% efficiency, however this could be revoked in favour of NECB tier 2 adoption – allowing builders to achieve efficiency requirements in a more customized, site specific manner.
- Interviewed market participants largely do not appear to consider the upstream carbon footprint that electrification would mean;
    - *the current electricity generation capacity in Ontario would not be able to accommodate a large-scale move to electrification, and supporting generation with natural gas upstream is less efficient.*
    - *COVID-19 economic impact could increase focus on the consumer energy cost burden, calling into question whether political priorities will shift away from sustainability and carbon*.
- Municipal momentum in green standards continues, but lack of consistency creates challenges for builders;
- Majority of market actors interviewed still see a role for natural gas beyond 2030; and,
- Although natural gas will not be fully displaced in new commercial buildings complying with proposed Tier 4 of the NECB 2020, compliance will likely result in an approximate **80% decrease** in demand.

Technology specific analysis conducted included cost and savings assumptions to provide insights into which Energy Conservation Measures (ECMs) for commercial new construction could potentially be considered for the next Ontario Energy Board's (OEBs) Demand-side Management (DSM) framework. ECM analysis with potential for DSM resource acquisition included in this report are noted in the table below.

ECMs Reviewed and Estimated TRC[1]		
Technology	**LEG TRC**	**LUG TRC**
Commercial Drain Water Heat Recovery (MURB with Pool)	3.7	3.73
Commercial Drain Water Heat Recovery (University)	2.37	2.42

[1] TRC is for illustrative purposes only based on available sources of information, and does not include a value for free ridership.

ECMs Reviewed and Estimated TRC (Cont'd)		
Technology	**LEG TRC**	**LUG TRC**
Water Source Heat Pumps with VRF	1.77	2
Commercial Drain Water Heat Recovery (MURB)	1.35	1.36
Perforated solar air collector	0.61	0.66
Air Source Heat Pumps with VRF	(0.50)	(0)

Based on insights gained through this research, SLG proposes the following program opportunities, Research Requirements and Potential Market Support Activities:

- Capitalize on municipal green standards momentum and create a market transformation initiative to support harmonization across the province - leverage key association and stakeholder groups such as the Association of Municipalities of Ontario, the Federation of Canadian Municipalities (FCM) and local governments to support harmonization of standards;
- Leverage the success of the SBD program by introducing an IDP "light" version of the program for small commercial construction which would use archetypes to encourage builders to adopt packages of measures that have prescribed savings and incentives.
- Support code awareness by delivering training session to stakeholder groups including the Ontario Architects Association, Professional Engineers of Ontario, municipal code authorities and others;
- Consider the development of prescriptive or quasi-prescriptive programs focusing on specific technologies or approaches such as commercial DHRH, solar air collectors, and WSHP-VRF.
- Consider an Air Tightness Testing market transformation initiative to support market capabilities in meeting expected code requirements and the TGS.

And a final recommendation is to consider expanding stakeholder outreach by using case-studies for social media, with a focus on *narrative* sharing of information on innovative natural gas solutions, the benefits of EGIs DSM initiative, highlighting RNG, and include education on the implications of electrification for both the consumer and the grid.

Historically, spending on sustainability and environmental initiatives has echoed the economy, and evidence suggests a correlation to government change too.[2] While economic downturns have resulted in major funding cuts in green initiatives in the past, it remains to be seen if the gains made through the Federal Low Carbon Economy Funding and the advancements of municipal green standards will sustain the progress made in the face of the economic disruption caused by the COVID-19 pandemic. Although change in government could see the removal of the Carbon Tax, and reduced environmental spending, the Federation of Canadian Municipalities and the global ICLEI, Local Governments for Sustainability and the TGS could provide the impetus to maintain the current trajectory towards a net-zero-ready new construction ethos.

[2] Globe & Mail (Mar 9, 2009), Recessions and elections in Canada and Ontario, https://www.theglobeandmail.com/news/politics/second-reading/recessions-and-elections-in-canada-and-ontario/article25684262/, Accessed July 4, 2020

1. Introduction

Commercial New Construction in Ontario is in the midst of a unique transformation where municipal jurisdictions are empowered to create Green Development Standards ("GDS") that exceed the provincial building code performance requirements that most mainstream builders were traditionally held to. The benefits municipalities can realize through implementing local GDSs extend beyond economics to support environmental goals relating to air & water quality, greenhouse gas reductions, and the local ecology – not to mention the quality of life for local residents.

While jurisdiction specific standards create new opportunities to advance building performance, they also create a new challenge for municipalities and the building community. For the building community in particular, GDSs require a divergence from the status quo in adopting new designs and technologies to meet higher levels of efficiencies and reduce building related operating emissions. Industry practitioners commonly agree that interpreting the OBC can be resource intensive and having diverging GDSs in different municipalities presents additional interpretation hurdles. Added to that, the National Energy Code for Buildings ("NECB") will present an incremental knowledge gap to overcome for commercial Part 3 buildings.

The NECB is in the final stage of a five-year review and update cycle, a process that has historically raised the bar with respect to building efficiency requirements. Unique to this review and update process is the introduction of the Pan-Canadian Framework on Clean Growth and Climate Change ("PCF") in 2016. PCF has driven an ambitious target of achieving a "net-zero energy ready" ("NZER") model building code by 2030.

In light of the changes facing the commercial new construction industry in Ontario, and in preparation for an impending new DSM framework, SLG has been retained to conduct this research in support of EGI's DSM strategy. The intention of the research is to support EGI in developing DSM program offerings for the new construction market that are informed by insights from market constituents; technical considerations around codes; potential energy conservation measures to consider; code implications for natural gas usage; and importantly, the role that natural gas might be expected to play in the mid to long term horizon.

2. Methodology

The scope and methodology of this study includes primary and secondary research as described below. Outputs from these activities were distilled and analyzed, and are documented in this report.

Secondary Research

National Energy Code for Buildings, Ontario Building Code, and Municipal Green Standards

SLG reviewed codes and labeling programs relevant to commercial new construction part 3 buildings in Ontario, including the OBC SB10, the proposed NECB 2020, EnergyStar for Multi-unit Residential Buildings ("MURBs"), and the LEED labeling programs, as well as a select number of local municipal green standards and climate change action plans to help inform the anticipated direction that the Ontario code will take in the near future (2022 to 2027).

Energy Conservation Measures

To inform potential Energy Conservation Measures ("ECMs") that EGI might consider as future DSM program opportunities for the commercial new construction market, SLG undertook a review of approximately 100 Savings by Design ("SBD") report outputs to identify the frequency of energy conservation measures to achieve savings above the current OBC. This list was cross-referenced with the outputs of the primary modelling research (described below), the current approved Ontario Technical Resource Manual, as well as information gathered in the primary market research activity described below with consideration for program design, and market uptake potential. This activity produced a list of ECMs that SLG prioritized for consideration by EGI. SLG then gathered sample data to support estimates on potential natural gas, electricity savings values, and incremental cost to enable SLG to run a Total Resource Cost Test for the measures.

Primary Research

Modelling

SLG developed a building model for three building archetypes: MURB, Long Term Care ("LTC") and Universities using NECB 2017 as the baseline, and then simulated 3 scenarios to reflect the proposed Tier 2, 3 and 4 NECB code changes. This analysis provided insights into the impact on natural gas usage between the step codes, as well as what ECMs would support achieving Tiers 2, 3 and 4.

Market Research

SLG conducted in depth interviews with 15 industry professionals, including building owners and developers, architects, energy modelers, municipal representatives, as well as technology and code subject matter experts. The interviews explored:

- market knowledge and awareness of changing code requirements;
- market knowledge and experience with municipal green standards, including compliance;
- how and by whom decisions are made to advance sustainable building projects;
- the desired role of EGI in supporting energy conservation;
    - perceptions on natural gas as a fuel source in terms of future commercial new construction, and in particular, within the construction of a Net-Zero building; respondents were asked to define their interpretation of a Net-Zero building;
- opinions on new technologies and those that present gaps in market adoption capacity; and,
- market levers and barriers that the commercial new construction industry faces.

Market practitioner surveys were useful in identifying potential program areas for EGI to consider for the upcoming future DSM Framework, with an emphasis on how to successfully identify and engage with market actors, such as designers, consultants, and equipment providers to support participation in EGI DSM programming.

3. Energy Building Codes

The landscape for energy related building code updates and associated processes has changed considerably with the advent of Canada ratifying its commitment to the Paris Climate Change Agreement in 2016, coupled with the creation of the Canadian Free Trade Agreement in 2017. These two federal agreements have resulted in the establishment of two new regulatory oversight bodies: the Canadian Free Trade Agreement's Regulatory Reconciliation and Cooperation Tables ("RCT"), to ensure a heightened focus on greenhouse gas ("GHG") reduction; and the PCF, which is dedicated to harmonizing regulations (including energy related building codes) across the country. This section outlines these federal regulatory processes for establishing and harmonizing building codes in Canada, and also provides insights into the current status of the NECB and the authors' interpretation of the implications for the OBC.

Background

The Regulatory Reconciliation and Cooperation Tables
The RCTs were established in 2017 as part of the Canadian Free Trade Agreement to help harmonize regulatory processes and regulations across federal, provincial and territorial jurisdictions to improve trade and business operations for companies functioning in multiple jurisdictions.[3] At a high level, the building energy code related RCT is designed to achieve regulatory cooperation and consistency on process timelines and regulations *"…to reduce or eliminate variations between [jurisdiction] construction codes and the National Codes by 2025, and to avoid creating new ones. It will provide suppliers and builders with more consistent rules across Canada."* [4]

According to the RCT 2019 Annual Report, negotiations with the jurisdictional parties have been completed and submitted to RCT for endorsement. Once endorsement is received, there will be a formal approval process for each jurisdiction's agreement to pass. The technical working group will then work to create an implementation plan for revised administrative processes outlining the development and adoption of new construction codes.

The Pan-Canadian Framework on Clean Growth and Climate Change
Created in 2016, the PCF documents Canada's vision to meeting its commitment to the Paris Agreement on GHG emissions reductions.[5] In relation to building codes, Canada's PCF action

[3] The Canadian Free Trade Agreement, 2020, Regulatory Reconciliation and Cooperation, https://www.cfta-alec.ca/regulatory-reconciliation-cooperation/, accessed June 22, 2020
[4] The Canadian Free Trade Agreement's Regulatory Reconciliation and Cooperation Table, 2019 Annual Report (2020), https://www.cfta-alec.ca/wp-content/uploads/2020/06/RCT-2019-Annual-Report.pdf, Accessed June 23, 2020
[5] Government of Canada, 2016, The Pan-Canadian Framework on Clean Growth and Climate Change, https://www.canada.ca/content/dam/themes/environment/documents/weather1/20170125-en.pdf, p4, accessed June 22, 2020

plan notes that the federal, provincial and territorial governments are tasked with developing and implementing more aggressive model building codes beginning in 2020, with the ultimate goal of creating a Net-Zero Energy Ready ("NZER") model code by 2030. [6]

Net-Zero Energy Ready

Working collaboratively, Natural Resources Canada and the National Research Council's Construction Research Centre (CRC) are overseeing the process to support Canada in achieving its commitment to reduce GHG by 30% (below 2005 levels) by 2030 through the NZER project.[7]

The NZER project is intended to support the Canadian Commission on Building and Fire Codes' (CCBFC) work in establishing an energy efficiency pathway that will enable meeting the NZER model code goal for new construction. The CCBFC also works with standing committees and is the decision body for changes to the National Energy Code for Buildings (among other things), though code change decisions are not made without extensive consultation.

National Energy Code for Buildings - Status

Historically, the National Energy Code for Building (NECB) changes occurred on a five-year cycle. With the PCF mandate to reach the Paris Agreement commitments on climate change, and the RCT objectives to harmonize provincial and territorial regulations with federal regulations, not to mention the disruption that the COVID-19 pandemic has caused for many Canadians, the current NECB process originally intended to be released in 2020 will more likely be released in 2021.

Public review and comment on the 2020 NECB closed on March 13, 2020. At this point, the CCFB standing committees will review all comments that have been submitted and will decide whether to:

- withdraw the proposed change;
- recommend that it be reviewed further for possible re-submission in revised form in a future public review; or,
- recommend that it be approved by the CCBFC, with or without modification.

NECB 2020 TIMING

The initial review consultation of the proposed changes to the NECB is over and participants indicate considerable feedback has been provided to the CCFBC. Standing committees of the CCFB are reviewing the feedback and are working to resolve potential changes to the proposed NECB. A second round of consultation could be required if changes to the proposed NECB at this stage are material.

[6] Pan Canadian Framework on Clean Growth and Climate Change, Canada's Action Plan to Address Climate Change and Grow the Economy (2016), https://www.canada.ca/content/dam/themes/environment/documents/weather1/20161209-1-en.pdf, (p17), accessed June 24, 2020

[7] National Research Council, 2018, **Laying the foundation for Net-Zero Energy Ready building codes by 2030,** https://nrc.canada.ca/en/stories/construction-innovation/laying-foundation-net-zero-energy-ready-building-codes-2030, accessed June 30, 2020

Once published, provinces and territories will be given a timeline for adopting NECB into their respective building codes which is anticipated to be approximately one year.

Proposed NECB Code Changes for Commercial (OBC Part 3) Buildings

The proposed NECB changes include a four-tier performance-based path as well as a four-tier prescriptive path:

Performance Tiers

Tier	Overall Energy Performance Improvement of Proposed Building
1	NECB 2017[8]
2	25% better
3	50% better
4	60% better

Prescriptive Tiers

The four progressive tiers have not been fully outlined, aside from the details described below:

- Minimum/tier 1 is equal to the prescriptive provisions of NECB 2020.[9]
- Progressive Tiers improve efficiency levels, top tier equivalent to NZER.
- Tier 2-4 energy performance levels can be reached using current technology.
- Tier 4 targets generally meet or exceed ASHRAE targets for NZER.

Until adopted by authorities having jurisdiction ("AHJ"), the tiered energy requirements are considered voluntary. CCFB approved technical changes will be published in Natural Resource Canada's *Codes Canada* publication.

ANTICIPATED IMPLICATIONS FOR OBC

In its current form, the OBC is close to Tier one of the NECB 2017. The province will need to determine which tier it would adopt as its minimum requirement, and there is some indication that Tier 2 is likely (with Tier 1 using NECB 2017). It is anticipated the NECB model tiers will be offered as an additional compliance path to the existing OBC compliance packages.

As the NECB harmonization moves forward, minimum efficiency performance standards will likely continue to follow those released in the USA. Changes to MEPS will impact the

[8] NECB 2020 is not finalized. NRCC also used the 2017 NECB as a reference case for their impact analysis. For additional insights, see proposed change 1527 : https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-development-process/public-review/2020/pcfs/necb17_diva_01.03.03.01._001527.html.

[9] The prescriptive provisions for NECB 2020 are not yet finalized.

technologies available in Canada, and as a result, impact the modelling analysis done for this project.

Ontario Building Code

After the NECB changes have been formally published, the Ministry of Municipal Affairs and Housing will review the associated changes and examine where the current OBC sits within the tiered framework, which will guide the decision on where to set the associated minimum requirement for Ontario. Assuming the NECB is published in 2021, Ontario will likely release its changes to the OBC in 2022 with a one-year implementation period for market compliance (approximately January 2023).

NECB 2017 AS REFERENCE FOR OBC

Given that NECB 2020 is not yet finalized, and based on our interviews with NECB 2020 review participants, we have based our analysis using NECB2017 and the tiers referenced in the Impact Analysis provided by the NRCC in Proposed Change 1527 Tiered Energy Performance Compliance. Nothing is final… until it is final.

Until adopted by authorities having jurisdiction ("AHJ"), the tiered energy requirements are considered voluntary. Technical changes will be published by Code Canada once the CCFB has finalized its approval.

3.1 Ontario Municipalities

Establishment of green standards for municipalities has faced some confusion since the mid-2000s. The Green Energy Act was introduced in 2009 and the Ontario Regulation created under it (397/11) required municipalities to create energy conservation and demand management plans for municipal operations. Many municipalities went beyond their internal operations and created high-level energy and GHG strategies and plans that articulated a longer-term vision to address climate change. Although the Green Energy Act was repealed in 2019, the municipal strategies do not appear to have followed suit. Indeed, it appears a growing number of municipalities have been working to implement GD [10] with 10 municipalities having approved plans and six in development (see Appendix A for a full list).[11]

While the OBC continues to be the primary requirement for new building construction in Ontario, municipalities have been working to encourage developers of new construction projects to go beyond code and also consider other sustainability based efforts including

[10] Mapping the Municipal Planning Process in Ontario, http://www.simcoemuskokahealth.org/docs/default-source/TOPIC_Environment_PlanningForHealth/mapping-the-municipal-planning-process_19dec20192b86e65f97be6bc38c2dff0000a8dfd8.pdf?sfvrsn=4, Accessed July 2, 2020

[11] Clean Air Council (2020, Intergovernmental Declaration on Clean Air and Climate Change, https://www.cleanairpartnership.org/wp-content/uploads/2020/03/2019-2023-Intergovernmental-Declaration-on-Clean-Air-Climate-Change.pdf, Accessed July 3, 2020 – except included in Appendix A

carbon reduction, resiliency and storm water management. Gaining traction has been especially slow for commercial new construction projects, with the exception of Toronto which has developed and implemented the Toronto Green Development Standard (see below), which appears to be the best practice model that other municipalities are watching. It is important to note that the local authority relates to the external environment as part of the Planning Act, which enables municipalities to implement Green Development Standards (GDS) through the Site Plan control (Section 41; subsection 164(4) of the Municipal Act, and subsection 3(2) of the City of Toronto Act). Municipalities may also pursue the creation of an Official Plan amendment or update to include GDS provisions[12] (eg, Richmond Hill, Halton Hills), however the question of legal authority has presented a significant barrier to implementation.

To support GDS creation, the Clean Air Partnership has been working with municipalities across Ontario in an effort to enable knowledge sharing and advancement of GDSs.[13] Excluding Toronto, GDS mechanisms used to advance building developments beyond OBC in other municipalities have primarily focused on single family dwellings and otherwise include voluntary metrics with a minimum score threshold that developers are required to reach to have their application approved.[14] Theoretically, once committed to by developers, the metrics are 'secured' through the approval process, however, developers have been reluctant to add additional requirements to their building projects. To date, the voluntary nature of moving developments above code in municipalities outside Toronto continues to impede adoption and uptake.

In addition to support from the Clean Air Partnership, municipalities can also leverage funding and information sharing from the Partners for Climate Protection ("PCP"), a global ICLEI Local Governments for Sustainability program delivered in conjunction by the Federation of Canadian Municipalities.[15] With more than 350 municipalities signed up, the PCP provides a milestone framework to support measurement and reduction efforts of GHG emissions.

Toronto Green Standard

By far the most influential and successful of the GDSs is the Toronto Green Standard ("TGS") which was introduced in 2010. Initially it was introduced as a voluntary standard to encourage the construction of new buildings to go beyond the OBC. The TGDS has evolved since its inception, and a Zero Emissions Framework (ZEF) was developed and came into effect in the 2018 update to the GDS. The ZEF supports the city's 2050 goal of reducing GHG emissions

[12] Clean Air Partnership (2018), Green Development Standards Primer Report, https://cleanairpartnership.org/cac/wp-content/uploads/2019/03/GDS-Primer-Report_V2.pdf, Accessed June 26, 2020
[13] City of Toronto (2017), Zero Emissions Building Framework, https://www.toronto.ca/wp-content/uploads/2017/11/9875-Zero-Emissions-Buildings-Framework-Report.pdf, Accessed July 2, 2020
[14] There have been some notable exceptions in the past where municipalities prescribed LEED compliance however these have generally been withdrawn.
[15] Federation of Canadian Municipalities Partners for Climate Protection website: https://fcm.ca/en/programs/partners-climate-protection

by 80% of 1990 levels, an integral component of which will be achieved through new buildings being constructed to a near-zero emissions level by 2030.

Through the TGS/ZEF, four progressive performance target tiers have been set, with Tier Four representing a near-zero emissions building for which fuel switching away from natural gas is encouraged. Assuming the timeline for implementation is not disrupted, Tier Four will remain voluntary until 2030 at which time natural gas usage may occur less frequently in new buildings. A corollary impact of the electrification of new buildings would likely see an increased need to review the electricity generation mix in Ontario, with a potential for natural gas generation upstream to support reliable peak load electricity generation. This is an important consideration because the carbon footprint of electricity will likely shift, though it does not appear that evaluation of this impact has yet been undertaken. It is important to note that natural gas generation to address the marginal electricity load will likely come at a lower combustion efficiency than if the natural gas was used at the source, and in combination with electricity line losses may not generate the desired impact on carbon reduction.

An excerpt from the TGS framework[17] is provided in the following text box.

[16] https://www.toronto.ca/wp-content/uploads/2017/11/9875-Zero-Emissions-Buildings-Framework-Report.pdfClean Air Partnership (2019), Clean Air Council Green Development Standards Workshop, https://cleanairpartnership.org/cac/wp-content/uploads/2019/03/GDS-Primer-Report_V2.pdf, Accessed July 2, 2020

[17] City of Toronto (2017), Zero Emissions Building Framework, https://www.toronto.ca/wp-content/uploads/2017/11/9875-Zero-Emissions-Buildings-Framework-Report.pdf, Accessed July 2, 2020

TORONTO GREEN STANDARD
ZERO EMISSION FRAMEWORK

In summary, under the Framework, new developments in Toronto will be required to reach select levels of performance in three primary metrics:

- TOTAL ENERGY USE INTENSITY, to encourage higher efficiency buildings and lower utility costs;
- THERMAL ENERGY DEMAND INTENSITY, to encourage better building envelopes, improve occupant comfort and enhance resilience; and
- GHG INTENSITY, to encourage low-carbon fuel choices and reduce building emissions.

To supplement the performance targets, a set of new or updated prescriptive requirements have also been recommended to help ensure modelled performance targets are realized in practice. These requirements extend to the following areas:

- RENEWABLE ENERGY GENERATION: Buildings designed to either accommodate connection to solar technologies, or to supply their total energy load with 5% from renewable energy sources or 20% with geoexchange, will help Toronto to meet its renewable energy generation targets.
- DISTRICT ENERGY CONNECTION: Buildings designed to enable connection or actually connect to a district energy system (where one exists or is slated for development) will help the City of Toronto to reduce emissions from the buildings sector.
- AIR TIGHTNESS TESTING REQUIREMENTS: Requiring buildings to conduct whole building air tightness testing helps to improve the quality and airtightness of the building envelope, as well as the performance gap between building design and performance.
- BUILDING COMMISSIONING REQUIREMENTS: Fundamental commissioning and enhanced commissioning requirements help to ensure that buildings are constructed and operated properly, improving overall building energy performance.
- SUBMETERING: Submeters installed by floor/defined use or by appliance/tenant will help to give a clear picture of building energy use.
- BUILDING LABELING AND DISCLOSURE: Requirements for buildings to annually report their energy consumption aligns with Provincial requirements, while naming the City of Toronto ensures the City can track and help to improve buildings' energy performance over time.

SeeLine Group Ltd.

Vaughan, Richmond Hill, Brampton & Markham Collaboration

Vaughan initiated a partnership with Brampton and Richmond Hill to collaborate on creating a "sustainability performance metric program" GDS in 2008, and recently Markham entered into the collaborative process with them. The GDS implementation strategy is currently under review to identify improvement opportunities with both the GDS metrics and participation within the builder community. While the framework for the GDS is virtually the same in the municipalities, threshold and points system varies. For illustrative purposes, metrics for Vaughan, Richmond Hill, Brampton, and Halton Hills (discussed below) are depicted in Table 1 below.

Table 1. Sustainability Metrics

Sustainability Site Plan Performance Metrics Vaughan, Richmond Hill, Brampton, Halton Hills				
Metric level	**Vaughan[18]**	**Richmond Hill[19]**	**Brampton[20]**	**Halton Hills[21]**
Minimum	31-45	32-45	35	36
Mid	46-60	46-65	53	
High	61+	66+	70	

Scores must surpass the minimum threshold[22] and are associated with selecting from a menu of sustainability metrics in the following categories:

- Built environment
- Mobility
- Natural environment and open space
- Infrastructure and buildings

The research and development of the sustainability metrics took LEED and the TGS into consideration.

Halton Hills

To further demonstrate the variability of sustainability metrics, Halton Hills has been included in this review, and the associated metrics are contained in Table 1 above. The Town of Halton Hills developed its Green Development Evaluation Checklist in 2010 and moved to a mandatory GDS in 2014. The Standard uses a LEED-like point system similar to those found

[18] City of Vaughan website: https://www.vaughan.ca/cityhall/departments/dp/Pages/Sustainability-Metrics.aspx
[19] City of Richmond Hill website: https://www.richmondhill.ca/en/find-or-learn-about/sustainability-metrics.aspx
[20] City of Brampton website: https://www.brampton.ca/EN/Business/planning-development/guidelines-manuals/Pages/Measuring-the-Sustainability-Performance-of-New-Development.aspx
[21] Clean Air Partnership (2017), Halton Hills Green Development Standards, https://cleanairpartnership.org/cac/wp-content/uploads/2017/05/Halton-Hills-Green-Development-Standards-CAC.pdf, and, https://pub-haltonhills.escribemeetings.com/filestream.ashx?DocumentId=6115 Accessed June 30, 2020
[22] Note: threshold scores differ for the size of the development (block or community level) and can also be impacted by proximity to environmental aspects as well as lifestyle amenities.

in Vaughan, Richmond Hill, and Brampton. A third review and revision of the town's GDS is underway. The authors note that the Town recently issued an RFP focusing on the use of an alternative financing approach (Local Improvement Charges) to encourage homeowners to undertake deep energy retrofits.

Analysis

Complying with the trending GHG emission reduction targets for commercial new construction buildings will result in a decrease in the use of natural gas as a fuel source. However, the pace of adopting more sustainable options has been slow in Ontario, and some note that the disruption to the economy that COVID-19 represents could impact the sustainability movement as governments will be more likely to consider the cost implications for building operators, tenants, and residents associated with electrification.

4. Market Practitioner Perspectives

To provide market perspective in relation to the changing code requirements at all levels of government, as well as to gauge the prospective role of EGI and natural gas as a fuel source in terms of the future commercial new construction horizon, SLG conducted in depth interviews with 15 industry professionals, including building owners and developers, architects, modelers, municipal representatives, as well as technology and code subject matter experts. The interviews also explored:

- how and by whom decisions are made to advance sustainable building projects;
- market levers and barriers that the commercial new construction industry faces;
- efficient technologies that are of focus and those that present gaps in market adoption capacity;
- understanding on knowledge mobilization of code changes and compliance; and,
- gaining insights into how interviewees define “Net Zero”.

Although the interviews in no way represent a statistically significant market research effort, the insights that were shared provided meaningful and likely representative opinions that will potentially help EGI form program strategies for the next DSM framework.

Noteworthy highlights in order of frequency included:

- Belief that natural gas will continue to be a fuel source for commercial new construction projects beyond 2030 (86%). This relates to both the fuel price advantage and the performance nature of some technologies;
    - Some respondents added that the electricity grid can likely not handle full electrification (40%*)
    - Some respondents noted renewable natural gas as favorable (40%*)
- Perception that cost is the primary barrier to moving towards more sustainable building (86%);

- Many respondents noted the supporting business case development would be a favourable role for the utility to play (60%*)
- Incentives were also noted as desirable (with at least three respondents noting the benefit of having incentives for air tightness testing)

- Code consultants are quickly becoming a regular contributor to knowledge mobilization for construction projects (50%*), and industry associations also play a vital role;
- Mechanical upgrades are often the easiest way to make efficiency gains, particularly in terms of optimizing HVAC system and inclusion of in-suite ERVs (65%)
- Windows present a hurdle for high-rise new construction (60%*)
  - some larger suppliers do not offer higher performing window walls
  - residential new construction customers prefer a high window to wall ratio
- Code related interviewees noted that the harmonization between NECB and OBC has demonstrated a need for stakeholder consultation to occur earlier in the process.

** Note: not all interviewees provided an opinion on every highlight – municipalities and code consultants tended to be technology agnostic and did not provide an opinion on related points, and some interviewees added incremental perspectives.*

SLG probed market actors representing building developers, including owners and operators to get more insights about their decision making process. The following summarizes responses as relates to who decides to move a project beyond code, and what the key drivers are:

- Often the decision making process is a collaboration at the leadership level. Even when a top down strategic directive is given, each project is reviewed by a team and the business case is always important – even when the directive is to try to push incrementally forward, some technologies are considered cost prohibitive or there is uncertainty due to lack of experience with it or the perceived potential to impact the construction timeline.
- The type of project and market demographics impact the level of openness to incurring upfront incremental cost or adopting new technologies;
  - 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.
  - Purpose built owners and operators, such as with retirement homes, can consider longer paybacks that would potentially reduce operating costs. Municipalities and institutional sectors such as schools seem more willing to

consider long term investments but may also be constrained by fixed capital budgets.
    - Tenant and resident energy costs post construction also play a factor, but to a lower degree.
- Awareness of technologies is important to support decisions; some developers do not have a line of sight on the options and associated benefits, and suggest that the utility may be able to play a role in helping to overcome that information gap through case studies and associations.

Overall trends in responses to the interview questions have been categorized and summarized in Table 2 below.

SeeLine Group Ltd.

Table 2, Summary of Market Actor Perspectives

Market Actor	Decision factor	Technology Interest	Code Knowledge	Barriers	Utility Role	New Construction & Natural Gas
Architect	- Cost - End-use client collaboration - Brand	- Building envelope - Renewables - Optimizing HVAC - Don't anticipate a new wave of technologies as much as optimizing those currently available	- Code consultants - Some in-house expertise - Associations	- Cost - Trade knowledge - Availability	- Business case development - Training - Incentives	- Perception is consistent that natural gas will need to be involved for a long time to come
Building Development	- Corporate social responsibility - Fiscal responsibility to investorsz - Brand - Integrated decision process with executive team, diverging perspectives	- Optimize interface between heat recovery for common area ventillation and air tightness - geo-exchange	- Code consultants - Associations - Mechanical engineers	- Trade knowledge - Availability - Customer desire for glass envelope - Cost CapX vs OpX model Business Case - Green funding/loans are not desireable to manage	- Offer lower rates for more efficient buildings - Provide technology case studies to developers to inform them of innovative and emerging opportunities	- Perception is predominantly that natural gas will need to be in the mix long term - Some awareness of full life cycle considerations for electrification
Municipalities (Includes both Green Standards & Code experience)	- Desire to reduce carbon emissions - Challenge gaining traction with builders - Building community has challenged whether municipalities have legal authority	- Where green standards in place, consultants help to develop the standard - Create reasonable path and pace of development so that the industry is not overwhelmed	- Outreach and consultation with varying degrees of effectiveness - Some partner or tie performance to building labels (LEED, EnergyStar for MURBs) - Some consulting community support with knowledge mobilization	- Acceptance and participation of building community (varies for municipalities) - Absolute targets are harder (eg. building envelop TEDI) - Establishing jurisdiction (depending on municipality) - Achieving storm water management targets	- Incentives to improve envelopes/performance - Training for skilled trades (there is a shortage) - Need more workforce awareness and development	- Overarching perception is that it is likely, but situational specific - One comment that natural gas is incongruous with carbon emissions reduction targets - Some desire for more RNG or CNG for fleets
Building Labels (LEED & EnergyStar)	- LEED uses absolute metrics - EnergyStar uses energy metrics - Likely the programs will continue to raise the bar around these requirements incremental to NECB step code changes	- Building compliance is determined by modeling - Technology agnostic, with LEED pushing towards carbon neutrality	- LEED uses absolute metrics related to carbon reduction and energy fuel cost savings based on energy modelling - change in Code is not anticipated to impact the nature of the calculations or the reporting requirements. - EnergyStar efficiency requirements will likely increase after the NECB step code is introduced.	- CaGBC has seen an impact on LEED applications for projects in the city of Toronto as developers note that adherence to the TGS with its impact on capital cost has resulted in fewer LEED registrations. - EnergyStar has changed the requirements for single family homes requiring the use of the EnerGuide Gigajoule scale however EnerQuality has not been advised of any changes to the MURB requirements.	- Opportunity to support EnergyStar for MURBs, as well as LEED	- Although LEED and EnergyStar are fuel agnostic, natural gas use is factored into LEED projects as a carbon penalty.

5. Energy Conservation Measures

As part of the project, SLG undertook an effort to prioritize 3-5 technologies that had the potential to be considered by EGI for it's resource acquisition DSM portfolio. To inform this work, SLG considered historic MURB SBD project reports, market practitioner perspectives, availability of technology mobilization, technologies already included in the Ontario DSM Technical Resource Manual ("TRM"), insights from our network of industry experts, and the implication future code changes could have on increasing focus on specific technologies. It is important to recognize that the potential savings from mechanical systems will continue to decline as code increases come into effect. Additionally, many systems have interactive effects that will require robust research. This is not a technology research project, and the information presented in this section is intended to inform decisions related to DSM technology preferences in the commercial new construction market.

Reviewing final energy model analysis for 96 SBD project participants over the period of 2014-2020, SLG collected technology and measure frequency used to achieve the 15% better than Code solution that the program requires. The review indicated that there were a wide variety of energy conservation measures ("ECMs") that were included in the various SBD solutions. Forty-two individual ECMs appeared as part of the SBD solutions, and of these, 10 technologies were used in more than 20% of the projects. See Table 3 below.

Table 3. Savings by Design Energy Conservation Measures

Measures	Counts	Percent
Wall Improvement	52	54%
ERV/HRV	46	48%
Low Flow Fixtures	39	41%
Window Improvement	34	35%
ENERGY STAR Appliances	31	32%
LPD Reduction	24	25%
Air Infiltration	20	21%
Boiler Improvement	20	21%
Roof Improvement	20	21%
Heat Pumps	19	20%
Drain Water Heat Recovery	16	17%
WWR Reduction	16	17%
Solar Wall/Roof	15	16%
AHU/MAU	13	14%
Air Flow Reduction (cfm)	12	13%
EC Motors	11	11%
Thermal Break	11	11%
VFD	10	10%
LED Lighting Fixtures	7	7%
Occupancy Control	7	7%
Slab Improvement	6	6%
VRF Units	5	5%

SLG notes that the top 10 technologies all have potential natural gas use implications as they either use gas directly, or their installation will result in lower gas use indirectly – eg. envelope improvements or heat recovery ventilation. Note that 2 of the top 5 measures – low flow fixtures and EnergyStar appliances, are both common and relatively inexpensive, thus representing “easy wins” for proponents wishing to improve the energy performance of their projects.

As noted above, SLG then triangulated the SBD project ECM review with the market practitioner perspectives, consulted with our network of industry experts, and also considered the future code changes and has focused on the following measures to determine whether they present potential opportunities for EGI’s DSM portfolio:

- Commercial Drain Water Heat Recovery (“C-DWHR”)
- Water Source Heat Pumps with Variable Refrigerant Flow (“WSHP-VRF”)
- Solar walls
- Air source heat pumps with variable refrigerant flow (“ASHP-VRF”)
- Ground Source Heat Pumps
- Air tightness testing23
- High performance fasteners to mitigate thermal bridging
- Window spacer enhancement

It is important to emphasize that this review does not represent detailed technology research and evaluation to any degree consistent with the requirements of the TRM. Rather, it is a high-level review using SBD modelling results and secondary literature where available. For the measures noted above, SLG considered the relevance for resource acquisition in terms of high-level cost-benefit potential, whether the technology was available for market adoption, and whether the market was interested in adopting the measure. Table 4 below documents this review.

[23] Air tightness testing was raised by market practitioners as something that would benefit from utility intervention. It is included for discussion as a potential market transformation enabling opportunity in the following section rather than a resource acquisition opportunity.

Table 4. Measure Prioritization Considerations

Measure	Benefit	Limitations
Perforated Solar Air Collector (aka Solar Wall)	- has potential to pass TRC threshold - gaining market acceptance - market capacity is specialized	- limited data available to support analysis - research will need to consider site specific parameters and restrictions
ASHP-VRF	- gaining market acceptance - relatively simple measure to include	- limited data available to support analysis - research will need to consider a variety of levels of HVAC load offset by the technology
WSHP-VRF	- gaining market acceptance - relatively simple measure to include	- limited data available to support analysis - research will need to consider a variety of levels of HVAC load offset by the technology - not always a suitable option
Air tightness testing	- high energy savings potential - dovetails with TGS & EnergyStar for MURB air testing requirements - whole building test sufficient for blgs under 40 Floors	- market traction is low - testing can be a challenge when buildings occupation is opened on a floor-to-floor basis
Commercial Drain Water Heat Recovery	- potential for up to 3% natural gas savings in certain applications - lower incremental cost for non-copper based technologies	- market traction remains low
Ground Source Heat Pump	- market interest - considered to be a reliable technology	- because this is fuel switching away from natural gas, did not consider this technology as a priority for this project - increases electricity load
High Performance Fasteners	- some interest expressed by market practitioners as an envelop improvement measure	- potential savings were considered not sufficient to explore further
Window spacer enhancement	- relatively low cost - coupled with performance windows shows promise for improved envelope R value and associated savings - additional benefits to occupants	window producers do not currently include in their production - baseline would need to be developed for different levels of performance windows - knowledge mobilization would be required to educate market on savings potential - drawbacks considered too challenging to consider further

As a result of this review process, SLG conducted further analysis on Commercial Drain Water Heat Recover ("DWRH"), WSHP-VRF, Solar Walls, and ASHP-VRF. Again, this analysis is not to be considered technology research consistent with a TRM assessment, but is presented for illustrative purposes with the recommendation that EGI undertake additional research if there is an interest in pursuing the ECMs for the DSM resource acquisition portfolio.

Commercial Drain Water Heat Recovery

C-DWHR acts as a heat exchanger, recovering heat from outflowing water.

Application

The most promising applications are those with a predictable and high usage of hot water, such as commercial kitchens[24] and high-rise MURBs

Table 5. Measure Key Data – DWHR (Based on Average Savings for High Rise MURB @ 385 Suites)

Parameter	Definition			
Measure Category	New Construction			
Baseline Technology	No DWHR			
Efficient Technology	C-DWHR			
Market Type	Commercial			
Annual Gas Savings (m^3/yr)[25]	University	46,879		
	385 Suite MURB with Pool	35,315		
	500 Suite MURB, no Pool	8,584		
Annual (kWh/yr)	University	173,872		
	385 Suite MURB with Pool	335,701		
	500 Suite MURB, no Pool	129,700		
Measure Life	20 years			
Incremental Cost[26]	estimate	$250.000		
Restrictions	For buildings with high hot DHW usage			
TRC estimate[27]	Legacy Enbridge	University: 2.37	With Pool: 3.7	No Pool: 1.35
	Legacy Union	University: 2.42	With Pool: 3.73	No Pool: 1.36

[24] Energy Centre of Wisconsin (2013), Drain Water Heat Recovery, A Field Study of Commercial Applications, http://www.seventhwave.org/sites/default/files/272-1.pdf, Accessed July 3, 2020
[25] Based on modelled data.
[26] Based on two recent MURB projects in GTA.
[27] Using EGI's TRC calculator, median values from EGI projects and modeling analysis, and incremental cost as noted above, with **zero** Free Ridership. Note: the calculator appears to have an inverse relationship with free ridership for negative TRC measures; in light of this uncertainty and in the absence of a value, it was left at zero.

Recommendations for further research:

The potential savings for C-DWHR applications requires a technical research study, and SLG recommends EGI consider high hot water use facilities such as commercial kitchen, SPAs and commercial laundry, in addition to high-rise MURBs.

Dual fuel system with an Electric Water Source Heat Pump (WSHP) with a Variable Refrigerant flow (VRF) compressor

An internal loop water source heat pump can offset space heating demand by extracting heat from a water source using an electric motor driven compressor. In commercial applications, the WSHP-VRF will draw from the chiller plant and/or boiler.

Application

WSHP-VRF technology can be used for space heating in all building types. .

Table 6, Measure Key Data WSHP-VRF

Parameter	Definition	
Measure Category	New Construction, Retrofit	
Baseline Technology	Heat Pump with no VRF	
Efficient Technology	Dual fuel system with an Electric Water Source Heat Pump (E-WSHP) with a Variable Refrigerant flow (VRF) compressor	
Market Type	Commercial	
Annual Gas Savings (m3/yr)	minimum	22,750
	maximum	846,134
	Median	216,296
Annual Electric Savings (kWh/yr)[28]	minimum	-54,186
	maximum	185,507
	Median	0
Measure Life	20 years	
Incremental Cost ($ CAD)	minimum	339,923
	maximum	1,458,250
	Median	545,829
Restrictions	An outdoor part of the system contains a compressor and large fan, which can be noisy in some environments, and has the potential to cause noise complaints.	

[28] Electrical savings may be possible if chilled water "waste" from the heat pump offsets sufficient electricity needed to refrigerate/freeze something during the winter.
[29] Based on floor area costs from Seventhwave (2015), Performance of Water-Source Variable Refrigerant Flow Measurement and Verification of Two Installed Systems, http://www.seventhwave.org/sites/default/files/water-source-vrf-2015.pdf, pg 30, Accessed June 25, (exchange rate of $1.36 CAD per USD) 2020in combination with EGI custom project costs and SBD projects

TRC estimate[30]	Legacy Enbridge	1.77
	Legacy Union	2

Recommendations for further research:

In addition to undertaking technology research, SLG recommends EGI consider the refrigerant impact on GHG equivalency to appropriately reflect the global warming potential of heat pumps compared with natural gas fired heating. If the desire to move to electrical heat pumps is to reduce GHG emissions, then heat pumps may present a net increase in GHG over natural gas heating equipment depending on the refrigerant used, typical leakage frequency and replacement/refill amounts as part of maintenance in the life of the equipment.

Perforated Solar Air Collectors

Perforated solar air collectors pre-heat incoming ventilation air that would otherwise require heating from traditional sources. Solar air collectors can also be useful to de-stratify air in spaces with high ceilings, similar to a destratification fan. Perforated solar air collectors can also be used to recirculate and heat indoor air, resulting in a reduced heating load.

Application

This technology can be used for heating ventilation air and space heating (recirculating air) in nearly all buildings types. More savings may be available in commercial applications.

Table 7, Measure Key Data – Perforated Solar Air Collector

Parameter	Definition	
Measure Category	New Construction, Retrofit	
Baseline Technology	No Perforated Solar Air Collector	
Efficient Technology	Perforated Solar Air Collector (i.e., Solarwall, SolarSheet, etc.)	
Market Type	Commercial	
Annual Gas Savings (m^3/yr)[31]	Estimate	51,185
Annual Electric Savings (kWh/yr)		0

[30] Using median values from EGI projects and modeling analysis, and incremental cost as noted above, with **zero** Free Ridership.
[31] Incremental cost and savings are based on CMHC (2017), Ottawa Community House Case Study, https://assets.cmhc-schl.gc.ca/sf/project/cmhc/pdfs/content/en/ochs-solar-wall-uses-renewable-energy.pdf, EGI custom project savings data, and modeling.

Measure Life	30 years	
Incremental Cost ($ CAD)[32]		$497,628
Restrictions	Solar technology should not be installed on the north side of any building.	
TRC estimate[33]	Legacy Enbridge	0.61
	Legacy Union	0.66

Recommendations for further research:

Due to variation in the savings and costs, SLG recommends EGI commission robust technology research to quantify both values in terms of collector area. Variables that will also affect savings will be occupancy hours and the ceiling height of the interior space.

Dual purpose system with an Electric Air Source Heat Pump (ASHP) with a Variable Refrigerant flow (VRF) compressor

Pumping heat from outside the building using an electric motor driven compressor offsets the internal building heating load, and as a result, reduces the required natural gas for heating. The technology functions in a similar manner to that of an air conditioner, which pumps heat out of a space, but a heat pump has a reverse flow valve which allows it to both cool and heat a space. As a result, there are also space cooling savings associated with the technology. Space heating natural gas savings are limited by the outdoor air temperature when the temperature becomes too cool. When this occurs, the system will switch over to a gas fired heating system.

Application

ASHP-VRF technology can be used for space heating in all building types, however for buildings over 5-6 storeys, it becomes limited to the refrigerant line lengths.

Table 8, Measure Key Data – ASHP-VRF

Parameter	Definition	
Measure Category	New Construction, Retrofit	
Baseline Technology	Packaged Terminal Electric Heat Pump	
Efficient Technology	Dual fuel system with an electric Air Source Heat Pump (ASHP) with a Variable Refrigerant flow (VRF) compressor	
Market Type	Commercial	
Annual Gas Savings (m^3/yr)	minimum	46,049
	maximum	59,247
	median	52,648

32 Based on industry interview/input of $35/sqft of solar wall for new construction.
33 For illustrative purposes only, a free rider value was left at **zero**.

Annual Electric Savings (kWh/yr)[34]	minimum maximum median	-239,487 -11,833 -125,660
Measure Life	20 years	
Incremental Cost ($ CAD)[35]	minimum maximum median	$113,944 $116,690 $115,317
Restrictions	For buildings above 5 Storeys/refrigerant line limitations	
TRC estimate[36]	Legacy Enbridge Legacy Union	(0.50) (0)

Recommendations for further research:

SLG recommends the research noted for WSHP-VRF also be conducted for ASHP-VRF if EGI is interested in exploring the technology for DSM quasi-prescriptive resource acquisition opportunities further.

6. Energy Modelling Results and Analysis

The primary purpose of the energy modelling analysis conducted for this study is to identify the potential implications that the proposed NECB changes would have on natural gas use. Additionally, modelling results specific to the ECM analysis noted above, provide insights into the savings potential. In collaboration with EGI, and in consideration of new construction building archetype frequency and typology interest, SLG focused the modelling exercise on a Multi-unit Residential ("MURB") high rise building, Long-term Care ("LTC") building type, and a University building (as a representative Municipal, University, Schools, and Hospital – aka "MUSH" segment).

For illustrative purposes, SLG conducted two additional model scenarios on the MURB archetype to provide insights into the implications on the NECB analysis resulting from inclusion of i. a 90% efficient boiler in the reference case and ii. natural gas heat pumps.

To perform this analysis, an archetype energy model was created for each building type. This model is meant to reference a "typical" building archetype in terms of shape, height and space use classification. While every building is different, it is the intent of the archetype model

[34] *Electrical savings may be possible if chilled air "waste" from the heat pump offsets sufficient electricity needed to refrigerate/freeze something during the winter, which would improve the cost benefit analysis
[35] Based on floor area costs from Seventhwave (2015), Performance of Water-Source Variable Refrigerant Flow Measurement and Verification of Two Installed Systems, http://www.seventhwave.org/sites/default/files/water-source-vrf-2015.pdf, pg 30, Accessed June 25, 2020
[36] Using median values from EGI projects and modeling analysis, and incremental cost as noted above, with **zero** Free Ridership.

approach that the results will be representative of common building designs in Ontario, and that applying the same ECMs should generate modelled results within a similar range.

EnergyPlus v9.2 and eQuest were used to perform the modelling. To investigate the four performance tiers, the archetype model was first adjusted to reflect compliance with NECB 2017 as per the modelling rules of Part 8 of NECB 2017. The model was then incrementally improved upon by adding ECMs until the 25%, 50% and 60% improved performance tiers were met. Where possible, the ECMs selected were technologies and approaches that are generally accepted and well known by the building industry and are readily available in the market. It should be noted, however, that ECMs perceived to be higher cost or less typical were necessary to include in the models in some cases in order to achieve the upper performance tiers.

The modelling followed Part 8 of NECB 2017, which defines the inputs that generates the NECB 2017 reference building, against which proposed designs are compared. Part 8 also includes many rules which must be followed when creating a proposed design energy model. Many of these rules are in place for modelling simplicity, or to disallow energy savings credit for ECMs which may be difficult to verify, particularly during the early design stages of a building.

Part 8 of the NECB, section 8.4.3.3. defines the infiltration rate of the proposed design model as 0.25 L/s/m2 , and Section 8.4.4.3. defines the reference buildings infiltration rate to match the proposed design model. In this way the modelling is simplified as the design team no longer needs to determine an appropriate infiltration rate, and any potential savings are dis-allowed by requiring the proposed and reference infiltration rates be equal. Note that this is the same modelling approach used in the Savings by Design program

Similar rules are in place throughout Part 8 to prohibit savings from water fixture flow rates, plug loads (including appliances), and solar heat gain from windows, among others. This approach works well when all that is required is to demonstrate compliance with the NECB 2017, as it shifts focus to only those design elements which are easily verified with design documents, and less likely to change early into operation. This is particularly true for MURBs. For example, low flow showerheads will result in less hot water usage, however in a MURB setting, it is difficult to verify that low flow fixtures will not simply be replaced with higher flow models by some residents once they occupy the space. A similar argument can be made for in-suite lighting and plug loads. However, when targeting increasingly higher performance tiers above a reference standard, these inputs can quickly become a limiting factor to improving relative performance. In this analysis, it was determined that some of these inputs had to be modified contrary to Part 8 rules in order to meet the upper performance tiers. These modifications have been indicated as such in the results analysis.

MURB Model Analysis

In terms of the HVAC system and fuel switching, Part 8 of the NECB 2017 also includes rules for determining the HVAC System type of the Reference building, based on the space type it serves. A somewhat different approach is taken with MURB in-suite HVAC systems. Rather than specify a system type, the NECB 2017 reference building in-suite HAVC system type is in most cases simply set equal to the proposed design. Once a system type is determined, heating and cooling sources are then defined. While the actual type of heating or cooling system may be different from the proposed design, in almost all cases the heating and cooling fuel sources match the proposed design. In other words, a natural gas-based heating system will never be compared to an electric or heat-pump based heating system for the purpose of modelling savings. The same is true for service water heating systems, where a natural gas-based system would only be compared to a natural gas-based reference. With these two rules in mind, a decision was made to keep system types and heating, cooling and service water heating sources consistent across the 25%, 50% and 60% improvement energy models. While it is acknowledged that a higher performance HVAC system, for example a variable refrigerant flow (VRF) system would likely generate more savings, this change would also require complicated changes to the NECB 2017 reference model, resulting in multiple reference buildings. For simplicity, a single reference building model was desired against which to compare all four tiers to.

Table 9, Key Model Characteristics, MURB Building Archetype

Key Model Characteristics	
Use/Occupancy	Residential, with associated amenities and at-grade retail
GFA, excl. parking (m2)	24,443 m2
Storeys	30
Suite Count	280
Bedroom Count	392
Occupancy	672 residents (1 per suite, plus 1 additional per bedroom)
Parking Garage	Underground. Approximately 9,000m2 based on review of several project designs
Climate Zone	London, ON (5A)
Weather File	London, ON 2016 CWEC
Key Schedules	NECB G - Residential NECB H - Corridor 24/7 spaces NECB C – Amenities and Retail

The following inputs were applied to each of the 3 performance levels above and beyond the NECB 2017 performance levels:

25% Improvement over NECB 2017

This performance level was found to be generally characteristic of a high performance MURB design that is seen today, for example consistent with a Toronto Green Standard v3 Tier 1 design, or a LEED v4 Silver design, including:

- Building enclosure inputs generally perform worse than the NECB 2017 reference inputs, in order to reflect a typical design while also accounting for the impacts of linear thermal bridging transmittance as required by Section 3.1.1.7;
- Window-to-wall ratio (WWR) is kept consistent with the NECB 2017 maximum allowance of 40%;

- Infiltration rates are as prescribed by NECB 2017 and are equal to the reference;
- Lighting is kept in line with NECB 2017 maximum lighting power densities in most spaces, with a credit for reduction in some spaces to reflect current LED technology;
- HVAC design is typified by fan coil units in suites, amenities, retail, and lobby spaces, while a corridor pressurization unit serves the corridors and entry lobbies. Suite and amenity ventilation is served by local Energy Recovery Ventilators (ERVs) with standard rated performance. All heating coils are served by a high performance condensing boiler plant and all cooling coils by a high performance, magnetic bearing variable speed water cooled chiller plant. Circulation pumps are all variable speed and all fan-coils have Electronically Commutated (EC) motors; and,
- Domestic hot water is served by high performance condensing hot water tanks.

50% Improvement over NECB 2017

The 50% improved model begins to incorporate ECMs which are above and beyond what would be considered standard practice as follows:

- The building enclosure includes enhanced thermal performance, and window assembly performance reflects triple glazing. WWR is also reduced to 35%, and a 50% savings credit for infiltration reduction was applied. This measure would need to somehow be verified via whole building pressurization testing;
- A 10% savings credit is applied to in-suite plug loads to account for Energy Star appliances;
- ERVs recovery effectiveness is increased from 65% to 80%, and EC motors are also applied to the ERV supply and exhaust fans;
- Flow reduction in domestic hot water use was also accounted for, reflecting low flow fixtures, particularly low flow showerheads and water savings from EnergyStar appliances; and,
- A perforated solar air collector (e.g. Solarwall or similar) was added to preheat the incoming ventilation air on the corridor pressurization air handling unit.

60% Improvement over NECB 2017

The 60% improved model incrementally increases performance of the 50% improved model in several areas:

- Glazing performance is further improved, reflecting triple glazing with fiberglass framing, WWR is further reduced to 30%, and infiltration savings are increase from 50% to 75%;
- Significant credits in lighting were also taken, reflecting a 50% reduction below NECB 2017 maximum allowances in most space types (excluding in-suite and retail spaces);
- A 20% savings credit is applied to in-suite plug loads to account for enhanced Energy Star appliances, e.g. heat pump or condensing dryers;
- ERVs recovery effectiveness is incrementally increased from 80% to 85%, and corridor pressurization unit fan efficiency is improved by 25%; and,

- The water cooled chiller plant is replaced with an air cooled chiller. While the efficiency of the chiller itself is reduced, this ECM also reflects the elimination of the cooling tower and condenser pumps, resulting in additional savings overall.

90% Efficient Boiler in Reference Case

Adjusting the reference case boiler to 90% efficiency had the following impacts on the NECB modelled savings noted above as follows:

NECB Tier	NECB Model Savings	90% boiler Savings
25% better run	25.71%	21.40%
50% better run	50.14%	47.25%
60% better run	60.40%	58.10%

Natural Gas Heat Pumps

Including natural gas heat pumps in the MURB analysis used the following assumptions in the model:

- In suite system type in the reference building is equal to the design. This means there is no credit for the system type. This also means the results from the MURB analysis will *not* necessarily be representative of other building types.
- All other spaces, the reference system is an electric based air source heat pump, with some NG for back up heating.
- Heating annual efficiency of 125%[37]
- All heating coils are served by NG heat pumps in the analysis.
- All cooling coils are assumed to be electric based DX.

The following were the impacts on the NECB modelled savings noted previously as follows:

NECB Tier	NECB Model Savings	NG Heat Pumps
25% better run	25.71%	18.3%
50% better run	50.14%	42.8%
60% better run	60.40%	49.8%

Discussion of findings

Results suggest that a 25% improvement over NECB 2017 can be met with energy conservation measures that are generally in line with what could be considered a high-performance MURB design, typical of Toronto Green Standard version 3 Tier 1, or LEED v4 Silver for example. This is characterized by high performance HVAC systems with energy recovery ventilation served by a high performance heating and cooling plants, LED lighting, dual pane glazing and fairly typical building enclosure characteristics. To meet the 50% and 60% improvement targets over NECB 2017, energy conservation measure which are less common needed to be included in the modelling. This includes moving to triple glazed windows, reducing window to wall ratios below 40%, utilizing solar air preheat via perforated

[37] Based on conversation with EGI engineer

solar air collectors (solar walls) and claiming savings for reductions in infiltration via air tightness measures. In this case, savings associated with air tightness would correspondingly likely need to be verified as part of a commissioning or a post-construction verification effort which would include air tightness testing.

90% Efficient Boiler
While Ontario currently requires 90% efficient boilers for commercial new construction projects, it remains unclear whether adopting the NECB step code will remove this requirement. Additionally, the corresponding proposed NECB prescriptive paths have not been released at the time of authoring this report, and whether there will be alternative paths that include different heating system efficiencies remains to be seen.

Natural Gas Heat Pumps
The modelling team concluded that including the natural gas heat pumps in the analysis reduced the modelled savings for the following reasons:

- The fancoil system benefited from central boiler savings from 80% to 95%, which are not present with natural gas heat pumps.
- There were previously savings from variable speed pumps which were no longer a part of the design in the heat pump model.

LTC Model Analysis

The archetype model is meant to reference a “typical” LTC in terms of shape, height and space use classification. While every building is different, it is the intent of the archetype model approach that the results will be representative of most LTC designs in Canada, and that applying the same ECMs should generate modelled
results within a similar range.

Table 10, Key Model Characteristics, LTC Building Archetype

Key Model Characteristics	
Use/Occupancy	Residential Long Term Care with associated amenities and at-grade retail
GFA, excl. parking (m2)	10,399 m^2
Storeys	3
Bed Count	160
Occupancy	160 residents (assumes 1 per bed)
Climate Zone	London, ON (5A)
Weather File	London, ON 2016 CWEC
Key Schedules	NECB G - Residential NECB H - Corridor 24/7 spaces NECB C – Amenities and Retail

The following inputs were applied to each of the 3 performance levels above and beyond the NECB 2017 performance levels:

25% Improvement over NECB 2017

This performance level was found to be generally characteristic of a high performance LTC design that is seen today, for example consistent with a Toronto Green Standard v3 Tier 1 design, or a LEED v4 Silver design.

- The building enclosure inputs generally perform worse than the NECB 2017 reference inputs, in order to reflect a typical design while also accounting for the impacts of linear thermal bridging transmittance as required by Section 3.1.1.7. Window-to-wall ratio (WWR) is kept at an average of 30%, typical of long term are residences. Infiltration rates are as prescribed by NECB 2017 and are equal to the reference.
- Lighting is kept in line with NECB 2017 maximum lighting power densities in all spaces.
- HVAC design is typified by fan coil units in suites, amenities, dining rooms, clinics, and lobby spaces, while a corridor pressurization unit serves the corridors and entry lobbies. Suite, amenity, dining room and clinic ventilation is served by local Energy Recovery Ventilators (ERVs) with standard rated performance. All heating coils are served by a high performance condensing boiler plant and all cooling coils by a high performance air-cooled chiller plant. Circulation pumps are all variable speed and all fancoils have Electronically Commutated (EC) motors. Domestic hot water is served by high performance condensing hot water tanks.

50% Improvement over NECB 2017

The 50% improved model begins to incorporate ECMs which are above and beyond what would be considered standard practice:

- Particularly, the building enclosure includes enhanced thermal performance, and window assembly performance reflects triple glazing. A 60% savings credit for infiltration reduction was applied. This measure would need to somehow be verified via whole building pressurization testing.
- A 20% savings credit is applied to in-suite plug loads to account for enhanced Energy Star appliances.
- Lighting credits were taken, reflecting a 30% reduction below NECB 2017 maximum allowances in most space types (excluding in-suite).
- ERVs recovery effectiveness is increased from 65% to 80%, and EC motors are also applied to the ERV supply and exhaust fans.
- Flow reduction in domestic hot water use was also accounted for, reflecting low flow fixtures, particularly low flow showerheads and water savings from EnergyStar appliances.

60% Improvement over NECB 2017

The 60% improved model incrementally increases performance of the 50% improved model in several areas:

- Glazing performance is further improved, reflecting triple glazing with fiberglass framing, and infiltration savings are increase from 50% to 75%.
- Significant credits in lighting were also taken, reflecting a 50% reduction below NECB 2017 maximum allowances in most space types (excluding in-suite). A 20% savings credit is applied to in-suite plug loads to account for enhanced Energy Star appliances, e.g. heat pump or condensing dryers.
- ERVs recovery effectiveness is incrementally increased from 80% to 85%.
- Finally, drain water heat recovery was added. Cold domestic water was preheated by the drain water heat recovery system, reducing the energy required to heat domestic hot water, resulting in additional savings overall.

Discussion of findings

Similar to the MURB model analysis, the LTC results suggest that Tier 1 improvements compared to NECB 2017 can be met with energy conservation measures typical of Toronto Green Standard version 3 Tier 1, or LEED v4 Silver. The high performance building would generally include high-efficiency HVAC systems with ERV, high performance heating and cooling plants, LED lighting, dual pane glazing and common building enclosure components, although the WWR for LTC is usually better than a typical MURB at 30%.

Meeting the Tier 2 and 3 improvement targets over NECB 2017 would require using less commonly used measures, such as triple glazed windows with high-performance assemblies, utilizing commercial DWHR and claiming savings for reductions in infiltration via air tightness measures. As previously mentioned, savings associated with air tightness would need to be verified at commissioning or post-construction.

University Model Analysis

University buildings can be complex, and many contain rooms purposed for laboratory use. SLG included laboratory spaces in the university model in order to support representing a broader “MUSH” building archetype since Hospitals will also require ventilation unique to laboratory spaces and these loads are significantly higher than other building archetypes. High laboratory specific ventilation loads typically have fewer energy efficient alternatives than some other loads. As with the MURB and LTC archetypes, the University building archetype was developed to meet NECB 2017, however modelling scenarios to achieve the incremental 50% and 60% performance requirements for Tier 3 and 4 presented a complication for the university archetype. Achieving a Tier 3 performance level was much more challenging than the other building archetypes, and achieving Tier 4 proved unattainable without a significant building redesign. As a result, a proxy natural gas usage value has been estimated to use to represent that likely reduction that a Tier 4 new university archetype would require.

Table 11, Key Model Characteristics, University

Key Model Characteristics	
Use/Occupancy	University with offices and laboratory use
GFA, excl. parking (m2)	24,443 m2
Storeys	3
Occupancy	972
Climate Zone	London, ON (5A)
Weather File	London, ON 2016 CWEC
Key Schedules	NECB Schedule D – School/University

25% Improvement over NECB 2017

The modelling results suggest that 25% improvement over NECB 2017 can be met with energy conservation measures that are frequently used for commercial buildings.

- Improved glazing performance on windows and improved envelope assemblies with higher R value, using a WWR of 40%.
- LED lighting to achieve 35% reduced load.
- High-performance HVAC systems with energy recovery ventilation employing an efficient steam loop heating system.

50% and 60% Improvement over NECB 2017

To meet 50% and 60% improvement targets over NECB 2017, energy conservation measures which provide more aggressive savings are needed.

- This includes switching to a ground source heat pump HVAC system connected to a geothermal loop.
- Including an energy generating PV system.
- Buildings with laboratories require high quantities of fresh air and this fact requires the design of the building, architectural, mechanical, electrical and otherwise, to be considered as a means of achieving higher building performance levels.

Discussion of Findings

Achieving NECB 2017 and Tier 1 could be fairly easily attained through improved envelope performance and heightened HVAC system efficiency. However, as noted above, a new university building construction project designed to meet Tiers 3 and Tier 4 above NECB 2017 would require a significant redesign, and include renewable generation including a geothermal loop with ground source heat pump, and onsite PV generation. [38]

[38] According to the SLG modelling for this project.

Model Results Impact on Natural Gas Consumption

According to the modelling performed for this project, it is not surprising that the natural gas usage in commercial new construction buildings will need to be reduced significantly to meet the higher Tiers for the NECB step codes. For more complex MUSH buildings, natural gas would potentially only be used as an auxiliary fuel source. Based on the model scenarios included in this project, the NECB step code impact on natural gas is detailed in table 12 below, and is expected to reduce gas consumption by approximately 80%.

Table 12, NECB Impact on Natural Gas Usage

NECB Impact on Natural Gas Use (m^3)				
NECB Tier	MURB	LTC	University	Decrease (Avg/Tier/Base)
Tier 1, NECB 2017 (baseline)	298,336	100,572	35,988	(N/A)
Tier 2, 25% improvement	189,587	63,369	23,479	37%
Tier 3, 50% improvement	92,696	30,788	3,071	71%
Tier 4, 60% improvement	69,924	18,777	3,071	79%

7. DSM Program Considerations

The Commercial New Construction market presents a unique challenge for DSM programming: building design and permitting can be a difficult and lengthy process; developers are focused on complying with a multitude of code requirements as well as appealing to the end use purchaser or tenant; and, budgets are critically tied to timelines in consideration of not only potential code changes, but potential unforeseen economic turbulence as well. It is not surprising that commercial new construction builders have often been slow to advance new construction projects beyond code… unless there is a strong business case and market for a more efficient building, or a compliance requirement that they must adhere to.

The proliferation of municipal green development standards to support climate change targets has provided the building community with a clear signal of what is to come, however there is significant risk aversion to investment in technologies and practices that may not only come with a higher initial cost, but also potentially prolong the construction process due to the requirement for greater quality control to support proper installation and commissioning, not to mention the potential risk that the a newer technology or practice may result in unintended and adverse outcomes. Challenges in moving the commercial new construction market beyond code compliance are further confounded by practical limitations in executing the OEB's DSM Framework – under which the current budgets and target setting mechanisms limit EGI's ability to provide meaningful incentives to the commercial new construction market to help overcome barriers.

Traditional resource acquisition programs have largely approached the commercial new construction market segment through custom project incentive offerings, comparing incremental savings over code compliance requirements and industry standard practice, with a lower degree of focus on prescriptive/quasi-prescriptive technology offerings. While prescriptive program offerings have had less traction in historical DSM programs, providing a mass-market type incentive structure to influence new construction projects with easily adaptable more efficient technologies no doubt has appeal from a program administration standpoint given the lower human resource burden.

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

SLG also notes that there are other potential ECMs that can support efficiency gains and emissions reductions that may be more desirable to developers and end-users given their lower associated utility costs, such as natural gas heat pumps. DSM is a proven mechanism to drive enhanced energy conservation measure uptake, however, policy makers do not always have a full understanding of the unintended consequences of advanced regulations can have. Regulations that favour the electrification of buildings, for example, may appear to provide reduced emissions at the end-use site; however, meeting the increased electricity demands will likely require natural gas electricity generation upstream which is inherently less efficient, not to mention the added costs it imposes on consumers.

Regulatory policy, technology appeal, and research limitations notwithstanding, accessing decision makers early enough in the design process makes administering commercial new construction resource acquisition programs harder still. SLG is aware of EGI sales strategies as they pertain to the SBD program, including monitoring commercial land purchase notifications and outreach to municipalities, developers, associations and building community practitioners. Aside from these techniques, this research has not revealed additional outreach mechanisms for EGI to explore.

Although the current commercial new construction Market Transformation (“MT”) program offering in EGIs portfolio has been well received in the building community, the post-construct incentive structure also appears to be presenting a limiting factor to verifying whether project design elements brought forward during the consultation phase were actually included in the constructed building. That said, program participants have repeatedly exalted the merits in learning about new and innovative building technologies and practices from subject matter experts.

The favourable response to the SBD offering speaks to an area that the market practitioner interviews have revealed as a desirable role for Enbridge to play – knowledge mobilizer. In particular, market practitioners noted the following as desirable information that Enbridge can play a role in proliferating:

- Business case development
- Municipal green standard harmonization
- Code training and awareness
- Capacity building with trades
  Real life case studies detailing new and innovative technology and practice

SLG realizes that EGI already engages with the market and policy makers, however, focusing on building more knowledge sharing into the process with a focus on the key pieces that the market has expressed interest could prove beneficial to EGI in several ways. It can:

1. help educate municipal policy makers on less understood and likely unintended economic and climate change implications of some current climate change initiatives;
2. support relationship building with key decision makers; and,
3. advance market readiness for more innovative technologies and practices.
4. Providing information that the market is interested in receiving will also serve to enhance EGIs reputation as a trusted energy conservation ambassador.

Parlaying the knowledge mobilization content into a DSM program offering requires identifying metrics to measure EGI efforts that the OEB and intervenors will agree are meaningful to advancing the desired energy conservation and consumer protection mandates. While the majority of the knowledge mobilization items note above may not offer that potential, efforts at harmonizing municipal GDS may be worth further consideration for MT.

Table 13, Municipal Green Standard Harmonization MT Program Concept

MT Potential Program Considerations – Municipal Green Standard Harmonization	
Metric Denominator	Number of Municipalities in Ontario (444)
Metric	1. Municipal Uptake of Harmonized GDS (#) 2. Building project uptake to advance tiers (phase two)
Baseline	0/444[39]
Rationale	• Aligns with PCF and Canadian Free Trade Agreement's Regulatory Reconciliation and Cooperation principles • Reduce confusion and uncertainties for builder community • Enable economies of scale for ECMs to be rolled out across province, thus reducing cost burden on consumers
Potential Partners	• Clean Air Partnership • Federation of Canadian Municipalities • AMO
Program activities	• Support consultation process for municipal GDS development • Support with business cases for municipalities to leverage in communicating their GDS • Provide incentives in collaboration with municipalities to support uptake of GDS advanced tiers

[39] This will require additional research to confirm. It appears that some municipalities have adopted a common LEED-like scoring approach, however it there does not appear to be a harmonized approach to target setting.

Another potential program area to consider for MT that market practitioners expressed interest in is supporting air tightness testing. Air sealing is commonly understood to present a sizeable energy savings potential, however without air tightness testing, even the best building envelope design on paper can fall short of the desired R value due to construction 'misses'.[40] Unless it is a compliance requirement, air tightness testing is very uncommon in Ontario.

Another potential program area to consider for MT that market practitioners expressed interest in is supporting air tightness testing. Air sealing is commonly understood to present a sizeable energy savings potential, however without air tightness testing, even the best building envelope design on paper can fall short of the desired R value due to construction 'misses'.[41] Unless it is a compliance requirement, air tightness testing is very uncommon in Ontario.

Table 14, Air Tightness Testing MT Program Concept

MT Potential Program Considerations – Municipal Green Standard Harmonization	
Metric Denominator	Commercial New Construction Attachments • recommend track by market segment for internal purposes • potential for separate metric for small commercial
Metric	1. Air Tests Completed per Market Segment • Require reports from participants • Collect data on number of air tests revealing design performance not met (to be used for third metric) 2. Incentives to support air sealing for low performance results in #1 • Requires follow-up testing to confirm performance 3. Savings achieved for follow up buildings (accumulated total #2 divided by low performers found in #1)
Baseline	TBD – requires current market practice baseline
Rationale	• Aligns with OEB mandate to minimize lost opportunities • Supports building capacity in market for air tightness testing • Encourages higher quality building practices and awareness of where issues might be encountered
Potential Partners (for promoting)	• City of Toronto • Clean Air Partnership • Federation of Canadian Municipalities • Service providers
Program activities	• Similar to HRR/HER model. When air testing capacity is built and market readiness is achieved, there is potential to transition this to a RA offering.

[40] Gray, Jason (2018), A Field Study of Exterior Airtightness Testing in Five Multi-Unit Residential Buildings, http://hdl.handle.net/1807/91731, Access July 3, 2020 (note, study includes review of secondary literature in addition to field testing results)
[41] Gray, Jason (2018), A Field Study of Exterior Airtightness Testing in Five Multi-Unit Residential Buildings, http://hdl.handle.net/1807/91731, Access July 3, 2020 (note, study includes review of secondary literature in addition to field testing results)

One final program for EGI consideration is expanding the current SBD offering to small commercial buildings.

8. Conclusions

While the creation of GDSs are gaining municipal momentum, the Commercial New Construction practitioners interviewed for this project overwhelmingly agreed that natural gas will remain in the mix beyond 2030, citing cost, practicality and reliability. Those who understand the upstream implications of increased electricity demand and generation that electrification presents, recognize that this may not achieve the intended outcome. Additionally, the economic implications of COVID-19 could result in greater political focus on reducing energy related costs for building operators, tenants, and residents associated with electrification pressures, thus slowing down the drive to NZER 2030.

As the Ontario government contemplates alignment with the NECB, the expectation is that the OBC will likely adopt Tier 2 of the NECB (25% better than the Reference) which will take effect in 2023. The NECB further contemplates increasing the requirements in the code to 50% and 60% thresholds for Tiers 3 and 4 respectively. In terms of natural gas usage in the new construction market in the 10 years), if the current path to ZERO continues, 2030 commercial new construction projects would likely be using only **20% of the natural gas** compared with today. That said, the energy modelling activity undertaken does demonstrate that there are viable gas using technologies in play at all the Tiers contemplated by the code.

In combination, the stakeholder surveys, energy modelling, and technology assessments undertaken as part of this project provided the following insights:

Trends:

- Municipal green standards momentum will continue and more municipalities can be expected to have carbon reduction targets for new construction – including for their own buildings and more generally;
- New technologies are not wholesale changes but are incremental – market adoption can be slow and developers are typically risk averse;
- Fuel prices are always uncertain however natural gas is expected to have a significant price advantage over electricity which will act as a counter-balance to the desire for greater electrification. Hybrid solutions that can accommodate fuel switching will likely experience more interest; and,
- Greater electrification is likely to cause even higher electricity prices and the upstream impact of marginal loads being supplied by natural gas may not bring the desired lower-carbon outcome.

Natural gas:

- Complying with the trending GHG emission reduction targets for commercial new construction buildings will likely continue to result in a decrease in the use of natural gas as a fuel source;
- Market practitioners and stakeholders are pragmatic and believe that natural gas will remain in the mix regardless of the Tier. This relates to both the fuel cost advantage and

the reality that some natural gas technologies provide greater performance than alternatives;

- While efficiency levels for boilers and domestic hot water may have reached their thresholds, some natural gas using technologies such as heat pumps offer greater efficiency levels and can be expected to see further adoption; and,
- Net Zero buildings can still accommodate natural gas usage, particularly if renewable natural gas is considered.

Program Opportunities, Research Requirements and Potential Market Support Activities:

- Capitalize on municipal green standards momentum and create a market transformation initiative to support harmonization across the province - leverage key association and stakeholder groups such as the Association of Municipalities of Ontario, the Federation of Canadian Municipalities (FCM) and local governments to support harmonization of standards;
- Leverage the success of the SBD program by introducing an IDP “light” version of the program for small commercial construction which would use archetypes to encourage builders to adopt packages of measures that have prescribed savings and incentives.
- Support code awareness by delivering training sessions to stakeholder groups including the Ontario Architects Association, Professional Engineers of Ontario, municipal code authorities and others;
- Consider the development of prescriptive or quasi-prescriptive programs focusing on specific technologies or approaches such as commercial DHRH, solar air collectors, and WSHP-VRF.
- Consider an Air Tightness Testing market transformation initiative to support market capabilities in meeting expected code requirements and the TGS.

And a final recommendation is to consider expanding stakeholder outreach by using case-studies for social media, with a focus on *narrative* sharing of information on innovative natural gas solutions, the benefits of EGIs DSM initiative, highlighting RNG, and include education on the implications of electrification for both the consumer and the grid.

Sources Cited

City of Brampton, Measuring the Sustainability Performance of New Development, https://www.brampton.ca/EN/Business/planning-development/guidelines-manuals/Pages/Measuring-the-Sustainability-Performance-of-New-Development.aspx, Accessed July 1, 2020

City of Richmond Hill, Sustainability Metrics, https://www.richmondhill.ca/en/find-or-learn-about/sustainability-metrics.aspx, Accessed July 2, 2020

City of Toronto (2017), Zero Emissions Building Framework, https://www.toronto.ca/wp-content/uploads/2017/11/9875-Zero-Emissions-Buildings-Framework-Report.pdf, Accessed June 27, 2020

City of Vaughan, Sustainability Metrics, https://www.vaughan.ca/cityhall/departments/dp/Pages/Sustainability-Metrics.aspx, Accessed June 26, 2020

Clean Air Partnership (2018), Green Development Standards Primer Report, https://cleanairpartnership.org/cac/wp-content/uploads/2019/03/GDS-Primer-Report_V2.pdf, Accessed June 26, 2020

Clean Air Partnership (2019), Clean Air Council Green Development Standards Workshop, https://cleanairpartnership.org/cac/wp-content/uploads/2019/03/GDS-Primer-Report_V2.pdf, Accessed July 3, 2020

Clean Air Council (2020, Intergovernmental Declaration on Clean Air and Climate Change, https://www.cleanairpartnership.org/wp-content/uploads/2020/03/2019-2023-Intergovernmental-Declaration-on-Clean-Air-Climate-Change.pdf, Accessed July 3, 2020 – except included in Appendix A

CMHC (2017), Ottawa Community House Case Study, https://assets.cmhc-schl.gc.ca/sf/project/cmhc/pdfs/content/en/ochs-solar-wall-uses-renewable-energy.pdf, Accessed June 27, 2020

Energy Centre of Wisconsin (2013), Drain Water Heat Recovery, A Field Study of Commercial Applications, http://www.seventhwave.org/sites/default/files/272-1.pdf, Accessed July 3, 2020

Federation of Canadian Municipalities Partners for Climate Protection website: https://fcm.ca/en/programs/partners-climate-protection

Globe & Mail (Mar 9, 2009), Recessions and elections in Canada and Ontario, https://www.theglobeandmail.com/news/politics/second-reading/recessions-and-elections-in-canada-and-ontario/article25684262/, Accessed July 4, 2020

Government of Canada, 2016, The Pan-Canadian Framework on Clean Growth and Climate Change, https://www.canada.ca/content/dam/themes/environment/documents/weather1/20170125-en.pdf, p4, accessed June 22, 2020

Gray, Jason (2018), A Field Study of Exterior Airtightness Testing in Five Multi-Unit Residential Buildings, http://hdl.handle.net/1807/91731, Access July 3, 2020 (note, study includes review of secondary literature in addition to field testing results)

https://cleanairpartnership.org/cac/wp-content/uploads/2017/05/Halton-Hills-Green-Development-Standards-CAC.pdf

Globe & Mail (Mar 9, 2009), Recessions and elections in Canada and Ontario, https://www.theglobeandmail.com/news/politics/second-reading/recessions-and-elections-in-canada-and-ontario/article25684262/, Accessed July 4, 2020

Mapping the Municipal Planning Process in Ontario, http://www.simcoemuskokahealth.org/docs/default-source/TOPIC_Environment_PlanningForHealth/mapping-the-municipal-planning-process_19dec20192b86e65f97be6bc38c2dff0000a8dfd8.pdf?sfvrsn=4, Accessed July 2, 2020

National Research Council, 2018, **Laying the foundation for Net-Zero Energy Ready building codes by 2030,** https://nrc.canada.ca/en/stories/construction-innovation/laying-foundation-net-zero-energy-ready-building-codes-2030, accessed June 30, 2020

National Research Council of Canada (2020), proposed changes 1527, proposed change 1527 : https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-development-process/public-review/2020/pcfs/necb17_diva_01.03.03.01._001527.html

Natural Resources Canada, How National Codes are Developed, https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-development-process/how-national-codes-are-developed, Accessed June 19, 2020

Pan Canadian Framework on Clean Growth and Climate Change, Canada's Action Plan to Address Climate Change and Grow the Economy (2016), https://www.canada.ca/content/dam/themes/environment/documents/weather1/20161209-1-en.pdf, (p17), accessed June 24, 2020

Seventhwave (2015), Performance of Water-Source Variable Refrigerant Flow Measurement and Verification of Two Installed Systems, http://www.seventhwave.org/sites/default/files/water-source-vrf-2015.pdf, pg 30, Accessed June 25, 2020

The Canadian Free Trade Agreement's Regulatory Reconciliation and Cooperation Table, 2019 Annual Report (2020), https://www.cfta-alec.ca/wp-content/uploads/2020/06/RCT-2019-Annual-Report.pdf, Accessed June 23, 2020

The Canadian Free Trade Agreement, Regulatory Reconciliation and Cooperation, (2020) https://www.cfta-alec.ca/regulatory-reconciliation-cooperation/, accessed June 22, 2020

SeeLine Group Ltd.

Appendix A
Municipal Green Action Declaration Excerpt

EXCERPT FROM INTERGOVERNMENTAL DECLARATION ON CLEAN AIR & CLIMATE CHANGE 2019 - 2023
CLEAN AIR COUNCIL, PROGRESS REPORT ON PAST CLEAN AIR COUNCIL DECLARATION ACTIONS
AS OF FEBRUARY 2020

DECLARATION ACTIONS

MUNICIPALIT Y	Green Development Policies - Corporate	Green Development Policies - Community	Community GHG reduction targets	Community Energy Plans	Corporate Energy Plans	Corporate Green Energy Production	Community Climate Action Plan	Green Procurement Policies/	Climate Change Adaptation/ Resilience Plans	Climate Change Adaptation/ Resilience Plans	Green Fleet Action Plan	Community Climate Change Action/ Environment
Ajax	Approved	In Development	Approved		Approved	Approved	Approved	Approved	Approved	Approved	Approved	
Aurora		In Development	In Development	In Development	Approved	Approved		In Development		In Development	In Development	
Brampton		Approved	Approved	In Development	Approved	Approved	Approved	In Development			Approved**	
Burlington	Approved	Approved	Approved	Approved	Approved	Approved	Approved	Approved	In Development		Approved**	
Caledon	Approved**	Approved	Approved**	In Development	Approved	Approved	Approved	Approved	In Development	In Development	In Development	In Development
Clarington					Approved			In Development			In Development	
Durham Region	In Development		Approved	Approved	Approved	Approved	Approved	In Development	Approved	Approved		Approved
Guelph			Approved	Approved	Approved				In Development	In Development		
Halton Region	Approved		In Development	In Development	Approved**	Approved	Approved	Approved		In Development	Approved	
Halton Hills	Approved**	Approved	Approved	Approved	Approved	Approved	Approved	Approved	In Development	In Development	In Development	Approved
Hamilton			Approved	In Development	Approved	Approved	Approved		In Development	In Development	Approved	
King	In Development	In Development	In Development	In Development	In Development	Approved	Approved	In Development	In Development	In Development	In Development	
London	Approved	In Development	Approved	Approved	Approved	Approved	Approved	Approved	In Development	In Development	In Development	Approved
Markham	Approved	In Development	Approved	Approved	Approved	Approved	Approved	Approved				Approved
Mississauga	Approved	Approved	Approved		Approved		Approved	Approved	Approved	Approved	In Development	
Newmarket			Approved	Approved	Approved	Approved	Approved	Approved	In Development	In Development		In Development
Oakville	Approved		In Development	In Development	Approved	Approved	Approved	Approved	Approved	Approved	Approved	
Oshawa			Approved		Approved		In Development		Approved			
Peel Region	In Development		Approved		Approved	In Development	Approved	In Development	Approved	Approved	Approved	
Pickering	In Development		Approved	Approved	Approved	Approved	Approved	Approved	Approved		Approved	In Development
Richmond Hill	Approved	Approved	In Development	In Development	Approved	Approved	Approved	In Development		In Development		
Toronto	Approved	Approved	Approved	Approved		Approved	Approved	Approved	Approved		Approved	Approved
Vaughan	Approved	Approved	Approved	Approved**	Approved	Approved	Approved	In Development	In Development		Approved**	
Whitby		Approved**	Approved	Approved	Approved**	Approved		In Development	In Development		In Development	
Windsor			Approved	Approved	Approved	Approved	Approved	Approved	In Development	Approved**	Approved	
Waterloo Region	Approved		Approved	Approved	Approved	In Development	Approved**		Approved	In Development		Approved
York Region	Approved	Approved	In Development	In Development	Approved	Approved	Approved		In Development	In Development	Approved	

Appendix B
B1. MURB Model Results Breakdown

	NECB 2017		25% Better			50% Better			60% Better		
End Use	**Electricity (kWh)**	**Natural Gas (m3)**	**Electricity (kWh)**	**Natural Gas (m3)**	% Savings	**Electricity (kWh)**	**Natural Gas (m3)**	% Savings	**Electricity (kWh)**	**Natural Gas (m3)**	% Savings
Interior Lighting	564,243	0	513,054	0	9.1%	513,054	0	9.1%	383,456	0	32.0%
Misc Eqp. / Plug Loads	678,700	0	678,700	0	0.0%	585,296	0	13.8%	547,957	0	19.3%
Heating	0	175,735	0	97,360	44.6%	0	32,916	81.3%	0	9,871	94.4%
Cooling	170,596	0	101,229	0	40.7%	84,487	0	50.5%	152,207	0	10.8%
Pumps	231,955	0	171,760	0	26.0%	166,821	0	28.1%	17,383	0	92.5%
Fans	188,793	0	163,324	0	13.5%	102,006	0	46.0%	91,601	0	51.5%
Domestic HW	0	113,603	0	92,229	18.8%	0	60,054	47.1%	0	60,054	47.1%
Exterior Lighting	8,725	0	8,725	0	0.0%	8,725	0	0.0%	8,725	0	0.0%
Annual Energy by Utility	**1,843,012**	**289,338**	**1,636,791**	**189,589**	**25.7%**	**1,460,389**	**92,970**	**50.1%**	**1,201,329**	**69,925**	**60.4%**
Combined Annual Energy Use **(ekWh)**	**4,897,470**		**3,638,224**			**2,441,845**			**1,939,502**		
Annual Energy Use Intensity **(ekWh/m2)**	**200.4**		**148.8**			**99.9**			**79.3**		
Annual GHg Emissions by Utility **(kg CO2e)**	**92,151**	**549,453**	**81,840**	**360,029**	**31.1%**	**73,019**	**176,550**	**61.1%**	**60,066**	**132,787**	**69.9%**
Annual GHG Emissions **(kg CO2e)**	**641,604**		**441,869**			**249,569**			**192,853**		
Annual Energy Cost by Utility **($)**	**$258,022**	**$63,654**	**$229,151**	**$41,710**	**15.8%**	**$204,455**	**$20,453**	**30.1%**	**$168,186**	**$15,383**	**42.9%**
Annual Energy Cost **($)**	**$321,676**		**$270,860**			**$224,908**			**$183,569**		

B2. Long Term Care Model Results Breakdown

End Use	NECB 2017		25% Better			50% Better			60% Better		
	Electricity (kWh)	**Natural Gas (m3)**	**Electricity (kWh)**	**Natural Gas (m3)**	% Savings	**Electricity (kWh)**	**Natural Gas (m3)**	% Savings	**Electricity (kWh)**	**Natural Gas (m3)**	% Savings
Interior Lighting	525,453	0	525,453	0	0.0%	380,003	0	27.7%	283,550	0	46.0%
Misc Eqp. / Plug Loads	190,181	0	190,181	0	0.0%	175,744	0	7.6%	175,744	0	7.6%
Heating	0	62,270	0	31,115	50.0%	0	11,526	81.5%	0	5,294	91.5%
Cooling	198,706	0	103,828	0	47.7%	91,972	0	53.7%	89,828	0	54.8%
Pumps	59,175	0	3,167	0	94.6%	2,300	0	96.1%	2,211	0	96.3%
Fans	96,658	0	73,753	0	23.7%	66,542	0	31.2%	64,739	0	33.0%
Domestic HW	0	38,302	0	32,254	15.8%	0	19,261	49.7%	0	13,483	64.8%
Exterior Lighting	47,375	0	47,375	0	0.0%	47,375	0	0.0%	47,375	0	0.0%
Annual Energy by Utility	**1,117,547**	**100,572**	**943,756**	**63,369**	**26.0%**	**763,936**	**30,788**	**50.0%**	**663,447**	**18,777**	**60.5%**
Combined Annual Energy Use **(ekWh)**	**2,179,252**		**1,612,724**			**1,088,951**			**861,669**		
Annual Energy Use Intensity **(ekWh/m2)**	**209.6**		**155.1**			**104.7**			**82.9**		
Annual GHg Emissions by Utility **(kg CO2e)**	**55,877**	**190,986**	**47,188**	**120,338**	**32.1%**	**38,197**	**58,466**	**60.8%**	**33,172**	**35,657**	**72.1%**
Annual GHG Emissions **(kg CO2e)**	**246,863**		**167,526**			**96,662**			**68,830**		
Annual Energy Cost by Utility **($)**	**$156,457**	**$22,126**	**$132,126**	**$13,941**	**18.2%**	**$106,951**	**$6,773**	**36.3%**	**$92,883**	**$4,131**	**45.7%**
Annual Energy Cost **($)**	**$178,582**		**$146,067**			**$113,724**			**$97,014**		

SeeLine Group Ltd.

B3. University Model Results Breakdown

	NECB 2017		25% Better Design			50% Better Design			60% Better Design		
End Use	Electricity (kWh)	Natural Gas (m3)				Electricity (kWh)	Gas (m3)	% Savings	Electricity (kWh)	Natural Gas (m3)	% Savings
Interior Lighting	128,800	-	71,060	-	44.8%	65,100	-	49.5%	65,100	-	49.5%
Plug Loads	71,970	-	71,970	-	0.0%	72,000	-	0.0%	72,000	-	0.0%
Heating	-	31,264	-	20,409	34.7%	83,600	-	-	83,600	-	-
Pumps & Auxilary	27,000	-	27,310	-	-1.1%	41,070	-	-52.1%	41,070	-	-52.1%
Fans	128,190	-	115,765	-	9.7%	65,300	-	49.1%	65,300	-	49.1%
Domestic Hot Water	-	4,724	-	3,070	35.0%	-	3,071	35.0%	-	3,071	35.0%
Energy Generation, PV System	-					-			82,670 kWh/year		
Annual Energy Use by Utility	355,960	35,988	286,105	23,479	27.4%	327,070	3,071	50.8%	244,400	3,071	62.1%
Combined Annual Energy Use *(ekWh)*	728,834		529,373			358,886			276,216		
Annual Energy Use Intensity *(ekWh/m2)*	155.0		113			76.3			58.8		
Annual GHG Emissions by Utility *(kg CO2e)*	17,798	68,341			31.6%	16,354	5,831	74.2%	12,220	5,831	79.0%
Annual GHG Emissions *(kg CO2e)*	86,139		58,892			22,185			18,051		
Annual Energy Cost by Utility *($)*	$49,834	$7,917	$40,055	$5,165	21.7%	$45,790	$676	19.5%	$34,216	$676	39.6%
Annual Energy Cost *($)*	$57,752		$45,220			$46,465			$34,892		

Utility Rates	
Electricity	Assumed, per current market prices: 0.14 $/kWh
Natural Gas	Assumed, per current market prices: 0.22 $/m3
Greenhouse Gas Emission Factors	
Electricity	Per OBC SB-10, Table 1.1.2.2: 0.050 kgCO2e/kWh
Natural Gas	Per OBC SB-10, Table 1.1.2.2: 1.899 kgCO2e/m3

Residential Part 9, New Construction: Identifying the opportunities for future DSM programming: Task 1

Sept 1, 2020

50 Fleming , Unit 6 , Cambridge, ON, N1T 2B1
TEL: 1-800-267-6830/519-658-6232 | FAX: 519-658-6103

Project

DATE: Sept 1, 2020 ***(updated with conclusions and observations pgs 10-12)***

TO: Jim Dunstan, ENBRIDGE

FROM: Andrew Oding, Building Knowledge Canada

RE: Residential Part 9, New Construction: Identifying the opportunities for future DSM programming Task 1

Background

In 2012, the province of Ontario implemented a supplementary standard SB-12 into the Ontario Building Code (OBC). This supplementary standard added a performance element to new construction requiring builders to meet energy efficiency minimum requirements via a prescriptive or performance track. The SB-12 supplementary standard was updated for 2017, and is currently still in effect. Going forward, the province is looking to adopt the proposed National Building Code 2020 – Tiered Energy Code for Homes and Buildings (NBC 2020) in lieu of the current OBC SB12. The proposed NBC 2020 is a tiered code, which has different performance levels (tiers 1-5). Provinces and territories can adopt the tiered NBC 2020 "model" and adjust the minimum compliance tier over time. In theory, provinces and territories would steadily adopt higher tiers (associated with federal funding programs or climate change goals) until all new homes would be built to tier 5 (e.g. Net Zero Ready-like performance). Currently in Ontario, the 2017 SB-12 standard has similar efficiency performance as the NBC 2020 tier 2 . ***(SEE REF 1).***

This report has accompanying documents produced through interviews with 7 Ontario based builders and developers ***"Future Energy Codes, Trends, Technologies: Builder / Developer Survey"***

It should be noted that approximately 40,000 – 45,000 Part 9 new builds are being constructed annually in the Enbridge Gas franchise area.

Important Note:
The following observations are the opinion of the report authors. These observations are simply conjecture and rudimentary estimates based on the experience of BKC. Economics, politics and other outlying societal movements will have a significant effect on **when** future building codes and volunteer programs may change and **if** the Province of Ontario will adopt the guidance of the proposed tiered energy efficiency for houses and buildings 2020 NBC.

1. Building Codes & Standards

i. Proposed National Building Code of Canada 2020 (Tiered Energy Code for homes and buildings)

- All provinces and territories have agreed to participate in the development of the NBC 2020 tiered energy code as an important part of the Pan-Canadian Framework on climate change.
- Part 9 Houses and small buildings: Ontario's current 2017 SB12 is the framework that guides the efficiency of this building sector. The NBC 2020 section that specifically addressee energy efficiency in part 9 buildings is referred to as section 9.36 ***(SEE REF 1).***
- 2020 NBC Tiered EE code underwent public review in early 2020. Due to the significant amount of interest and public review comments, it is expected that the final model energy code will be released/publicized in mid-late 2021 by Codes Canada.
- Province and Territories: It is expected that the formal adoption by the province and territories will take 1 to 3+ years. Provinces wherein the 2015 NBC is already referenced **(SEE REF 1),** may be able to adopt the tiered code much sooner than provinces such as Ontario who currently reference their own code (SB12 and SB10).
- Ontario's MMAH under the current Ford administration, has signaled an interest in harmonizing the building code. Specifically, harmonizing the energy related sections SB12 and SB10, with the 2020 proposed tiered energy code.
- Ontario's MMAH has publicly indicated to the Ontario Homebuilding Association members OHBA, that the intent is to "harmonize" or adopt the 2020 tiered energy code 18 to 20 months from date of publication.This places notional Ontario adoption at end 2023 or early 2024
- Ontario is represented on the NBC Standing Committee for energy and houses and buildings by a MMAH staff member.

ii. Where do we anticipate Ontario will land regarding Step Code between 2022-2027?

- How does the current Ontario SB12 2017, Energy Star tm 17.1 and Net Zero Ready tm compare to the NBC 2020 Tiers?
  - ***(SEE REF 2)***
  - It should be noted that south of the border, in the US;
    - the 2021 IECC (International Energy Conservation Code) has now been registered. It represents the single biggest efficiency "jump" since the inception of the 2012 IECC (3yr model code cycle).
    - the 2021 IECC code development cycle saw the largest industry participation ever recorded for development of a building related code.
    - the 2021 benchmarks for EE place the specifications for Part 9 homes very near to the benchmark set by the DOE program "Zero Energy Ready Homes"

- as of Jan 1 2020, 27 US states have adopted mandatory air tightness testing as part of the 2012, 2015, 2018 + IECC code model.

iii. Ontario Energy Code Potential Scenarios: SB12 vs NBC 2020 9.36

- Should Ontario decide **not to harmonize** with the NBC 2020 tiered energy code and continue with the SB12, here are some considerations:
  - No changes will likely be made until 2023, or beyond. Keep in mind, the SB12 is already comparable in performance to tier 2 of the NBC 2020. ***(SEE REF 2)***
  - Ontario's MMAH would still need time to review and apply all of the new NBC 2020 details and associated changes to ALL Part 9 sections and related standards (CSA, CGSB, etc). Some harmonization, at minimum, would be needed. E.g. updates in the NBC 2020 that affect change to other parts of the Part 9 code (Part 7 plumbing, 9.25 Air Tightness, and more)
- Should Ontario decide **to harmonize** with the NBC 2020 tiered energy code, here are some considerations:
  - Once the NBC 2020 is released in mid/late 2021, Ontario would then need time to vet the standard more closely with industry and review administrative changes to existing systems. E.g. the BCIN designation, industry education and knowledge, building officials and preparedness, etc. Due to the significant administration updates, compliance protocol changes, and general unfamiliarity with the NBC 2015, Ontario will need a few years to prepare the industry.
  - It could take 2+ years for the industry to prepare for the change. This places the potential "adoption" of NBC 2020 in and around 2024, or beyond.
  - Please note this is the opinion of the report authors. Economics, politics and other outlying societal movements could affect Ontario's harmonization or acceptance of model NBC 2020

iv. Do we anticipate an upward progression of steps within the five-year time frame?

  - Between 2020 and 2025 there may be little progression beyond the Tier 2 level of efficiency at the Provincial/Ontario level. This said, the provincial political landscape could change, and some progression could happen between 2023 and 2025.

v. What role do we anticipate municipalities playing in terms of setting and enforcing Steps?

  - See the comments in the accompanying document ***"Future Energy Codes, Trends, Technologies: Builder / Developer Survey"***
  - Municipalities are taking aggressive action towards both climate change and resiliency through development of Community Energy Plans (CEP) / Municipal Energy Plans (MEP)
  - It is worth noting that municipalities are targeting both reduced energy and reduced carbon. Terms like "net zero carbon" or "zero emissions" are used frequently within aspirational municipal planning goals and targets. This said, there appears to be limited understanding of what net zero carbon developments are.

i. Does Net Zero Carbon simply require all electric systems to limit operational carbon to zero?

ii. Does Net Zero Carbon enable the use of renewables to off-set any on–site carbon production by NG based appliances?

iii. Is Net Zero operational carbon really the issue, OR is it embedded carbon within the materials and construction process?

- Early in the stages of draft plan development, builders/developers are being asked by regional planning authorities and respective city council participants to identify how their project intends to meet notional benchmarks of Net Zero energy and/or Net Zero Carbon.
- Some municipalities have specific performance targets required of developers (e.g. Toronto Green Building Standard, Whitby Green Building Standard) which speak to a variety of metrics - including energy, water, waste and/or carbon.
- Many Ontario municipalities are aware of and engaged in the NBC 2020 code development process. Some have identified that future federal funding incentives tied to affordable housing and CMHC development loan assistance programs are likely to be "harmonized", or referenced to, the NBC 2020 Tiers
- Developers/builders often struggle to identify HOW various municipal CEP's can be met in an affordable and efficient manner. This presents an opportunity for utilities to partnership with the industry and present solutions at the community scale.

vi. What jurisdiction do municipalities have to impose their own standards?

- The Province of Ontario encourages municipalities to develop their own CEP/MEP and associated criteria.
- Under the existing planning act of Ontario, Jurisdiction Having Authority (JHA)'s have limited authority to enforce any performance or technologies that exceed the Ontario Building Code. However, this opinion needs to be balanced with the fact that most municipalities ask for compliance with CEP or MEP early on in the development application cycle. The impetus for developers needing to meet or "agree to" the CEP/MEP is more about expediting the project approvals and limiting any factors that would cause the municipality or "interest" groups to delay initial development approvals (Draft plan approval).

vii. Which municipalities are anticipated to be most aggressive with their positions regarding Step Code and which step do we anticipate they will land on?

- See the comments in the accompanying document ***"Future Energy Codes, Trends, Technologies: Builder / Developer Survey"***
- Many municipalities in ON have been active members of FCM (Federation of Canadian Municipalities). FCM programs and incentives support the development and application of CEP/MEP. https://fcm.ca/en/programs

- Municipal Energy Plans are encouraged by the Province of Ontario. Current, participating municipalities are identified on the Ontario.ca web page. https://www.ontario.ca/page/municipal-energy-plan-program
- Most, if not all, of the MEP/CEP in Ontario are developed in conjunction with municipal climate change goals and programming.
- Toronto, Whitby, and Markham have specifically identified the CHBA Net Zero Ready Home^tm program as meeting the "top tier" of their respective programs. Other municipalities have expressed similar goals around "Net Zero Ready" energy.
  Oakville, East Gwillimbury, and others have identified Energy Star^tm or "similar" performance levels as part of CEP/MEP goals.
  In relation to comparable levels of performance within the proposed NBC 2020 9.36, Energy Star^tm will be **similar to Tier 3** and Net Zero Ready Home^tm will be **similar to Tier 5.**
- At this time, the following municipalities have a CEP/MEP in place which would directly affect new developments. This is not an exhaustive list of municipalities who have CEP/MEP programs in place:
  i. Toronto ; Toronto Green Building Standard https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/
  ii. Whitby : Whitby Green Building standard https://www.whitby.ca/en/townhall/whitby-green-standards.asp
  iii. Guelph https://guelph.ca/plans-and-strategies/community-energy-initiative/
  iv. Markham https://www.markham.ca/wps/portal/home/about/sustainability/energy/municipal-energy-plan
  v. Vaughan https://www.vaughan.ca/cityhall/environmental_sustainability/Pages/Municipal-Energy-Plan.aspx
  vi. Oakville https://www.oakville.ca/environment/community-energy-plan.html
  vii. Kingston https://www.cityofkingston.ca/residents/environment-sustainability/climate-change-energy/community-energy-plan
  viii. Durham https://www.durham.ca/en/living-here/durham-community-energy-plan.aspx
  ix. Newmarket https://www.newmarket.ca/communityenergyplan
  x. Sudbury https://www.greatersudbury.ca/live/environment-and-sustainability1/clean-energy/#:~:text=Community%20Energy%20and%20Emissions%20Plan,and%20a%20clean%20energy%20future.

xi. London https://www.london.ca/residents/Environment/Energy/Pages/Community-Energy-Action-Plan.aspx

viii. Natural Gas Consumption in Part 3 and Part 9 Buildings: A comparison of how natural gas is applied in buildings today vs. how it is anticipated to be applied in buildings after the imposition of the new Step Code.

- For Part 9 (residential construction and small buildings, >3 story) any changes to NG application will be affected more by **which tier** Ontario might adopt to commence application of the NBC 2020 9.36.
- Limited changes to current NG applications in Ontario homes (Part 9) would be needed, up until Tier 3 (similar to current Ontario Energy Star[tm] v 17.2).
- Outside of direct impact on loads or equipment efficiency due to increasing efficiency tiers, the NBC 2020 9.36 does make some reference to proposed updates to appliance standards.
- Aside from the effect on minimum building code compliance in Ontario, more impact will be had on national programs under which developers/builders participate in. For example:
  a. CMHC and Genworth mortgage insurance rebates and incentives for new home buyers **may** be harmonized with the advanced tiers of the NBC 2020 9.36
  b. CMHC affordable housing lending programs for developers **may** be harmonized with the advanced tiers of the NBC 2020 9.36
  c. Federal tax incentive programs or clean energy incentive programs (e.g. home renovation tax credits and incentives **may** be harmonized with the advanced tiers of the NBC 2020 9.36

- The adoption of the **higher tiers 3,4,5**, will result in significant changes to loads within Part 9 residential homes and buildings. Based on current experience with NZ communities across Canada, the following are examples of how NG applications could be affected. Overall, load profile changes that may affect NG based appliance use in new homes may include:
  - **Domestic Hot Water** will become the largest operational load for homes designed to the upper tiers 4 & 5.

    This may result in:

    - More use of Combo/Combinations, domestic hot water/space heating systems, and equipment
    - Increased use of Drain Water Heat Recovery
    - Air-to-water heat pump technology has advanced substantially in the last 10 years. With CO_2 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
  - **Space heating loads** will be reduced for homes designed to upper tiers 3,4,5,
    - Small space heating equipment
    - More use of Combo/Combinations domestic hot water/space heating systems and equipment
    - Lower loads enable more efficient use of air source heat pump technologies, if even for part load conditions.
  - **Cooling loads** are growing in homes – Tiers 1-5
    - AC is a standard in most homes

- Higher cooling loads (more windows, occupant expectations, and more)
- Cold climate ASHP systems will compete with NG space heating + Air conditioner systems.

ix. What will be the biggest challenges for builders in adopting the new Step Code?

- See comments in the accompanying document ***"Future Energy Codes, Trends, Technologies: Builder / Developer Survey"***
- **Affordability and cost of home ownership.** To make the transition to NZR homes, the industry needs proper financial mechanisms and tools (e.g. appraisal tools) which account for Total-Cost-Of-Ownership: e.g. Total monthly expense of Mortgage, taxes, and utilities.
- **Marketing and Sales**: 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.
- **Natural resistance to change.** The residential construction industry struggles with making change, or transitioning to new technologies and new processes.
- **Education and Learning**: Keeping up with code changes, standards updates, and technology advancements. Stakeholders such as designers, building officials, and BCIN designates will require significant time/education/training to move from the current Ontario based SB12/SB10 to the new NBC 2020.
- **Depleted Skilled work force**: The industry is feeling the effect of an ageing workforce and also struggles to bring new, young, skilled labor in.

2. Volunteer Labelling Programs

i. How will housing/building volunteer programs be adjusted to accommodate the new Step Code adoption?

- In relation to comparable levels of performance within the proposed NBC 2020 9.36, Energy Star^{tm} will be similar to Tier 3 and Net Zero Ready Home^{tm} will be similar to Tier 5 ***(SEE REF 2)***
- If Ontario were to adopt the NBC 2020 9.36 (Tier 1 or 2), limited changes would be made to the existing labelling programs in Ontario.
- Energy Star^{tm} in Ontario is already transitioning to the national EnerGuide^{tm} for homes metric (GJ base) in 2020-21.
- Net Zero Ready Home^{tm} will likely adjust program targets to harmonize with the FINAL NBC 2020 9.36 Tier 5 performance metrics.

ii. Will requirements within these volunteer programs change over the next 6 years?

- For Energy Star^{tm}, any significant increases in efficiency for participating homes would likely not occur until 2025 or beyond **if** Ontario were to harmonize with either Tier 1 or 2 of the NBC 2020 9.36.
- Given the time period needed by the province of Ontario to simply harmonize with the NBC (at the same equivalent efficiency tier as current SB12 2017), any upward adjustments to the higher tiers of 3-4 may not happen until 2025-26 or beyond.

- It should be noted that "programs" are also subject to updates in standards (e.g. CSA, CGSB). Should standards for residential windows or residential HVAC systems be updated, resulting changes to volunteer programs will also be made.
- Volunteer programs across North America are moving beyond energy metrics to carbon based performance metrics. Programs such as LEED^{tm}, Passive House^{tm}, Living Building Challenge^{tm}, have carbon benchmarks or metrics. Operational carbon produced at the home/building appears to be the given metric for most programs at this point. Embedded or embodied carbon is swiftly becoming the "next frontier" metric for advanced housing and building programs.

3. Market / Code trends that could impact natural gas consumption in buildings and/or adoption of alternate low carbon technologies.

- See comments in the accompanying document ***"Future Energy Codes, Trends, Technologies: Builder / Developer Survey"***
- NBC 2020 9.36 Tier 3,4,5 will require significant improvements to the building enclosure. As a result, homes will have significantly lower space heating loads. ***(SEE REF 3)***
- The National Building Code of Canada has signaled that further development of energy efficiency minimums for existing homes and buildings will commence in 2020-2021.
- There is aggressive investment by public and private sources in reducing energy use in existing houses and buildings. The Federal Government of Canada and many provinces have already signaled their intention to incentivize substantial retrofits for houses and buildings. As a result of these initiatives to bring the efficiency of existing homes to Net-Zero-Ready performance, significant reduction in heating loads and domestic hot water loads will occur.
- Developers of large scale communities across Ontario are being asked by municipalities to provide housing/buildings (at community scale) that are Net Zero Ready Energy and/or Net Zero Carbon. Developers are responding by investigating technologies, concepts, and design practices which significantly decrease the energy use at both the house/building scale and at the community /infrastructure scale. Example projects under way :
  - West 5, Sifton Development, London ON
  - Spring Water community, Mattamy Homes, Markham ON
  - Doug Tarry Communities, St Thomas ON.
- Identification of carbon reduction targets / energy reduction targets in MEP & CEP programs across the Province of Ontario.
- Introduction of carbon reduction metrics into volunteer programs such as LEED^{tm}, Passive House^{tm}, Living Building Challenge^{tm}.
- Building codes are moving beyond energy reduction targets and developing minimum standards for carbon reduction for houses and buildings.

4. Technology Scans-Exploration of Efficiency Opportunities

- See comments in the accompanying document ***"Future Energy Codes, Trends, Technologies: Builder / Developer Survey"***

ii. Comparison of the types of **natural gas efficiency** opportunities available today vs. those anticipated to continue to exist after the introduction of Step Code.

- A new home built to the current Ontario Building Code SB12 2017 is nearly 55% more efficient than a home built prior to 1990. To put this in perspective, a new home in 2020 has an equivalent efficiency to that of an R2000 certified home built between 1990 and 2005.
- Opportunities to further increase efficient use of NG are narrowing as the overall energy load of the home decreases. There are a few remaining energy conservation measures (ECM) which further reduce NG consumption in a new home. Further analysis of potential ECM's and associated impact on a variety of housing types has been suggested for Task 2 of this project.

ECM ENERGY CONSERVATION MEASURES ***Town Home (End), 2,085 sqft, Two Story, Zone 5, WWR 12.5%***

Measure or Technology	GJ	GHG	Operational Cost	Cost to Construct
Air tightness 3.0ACH50 to 0.6 ACH50	13.55	0.698	$ 188.13	$ 1,900.00
Air tightness 3.0ACH50 to 1.5 ACH50	8.56	0.44	$ 118.96	$ 250.00
Above Grade Wall 2x6 16" oc R22 to 2x6 16" oc R22 +10	6.88	0.377	$ 98.55	$ 400.00
Below Grade Wall R12 to R20 Blanket	3.62	0.184	$ 50.74	$ 150.00
Window 1.6u/.45 SHGC to 1.2u/.22 SHGC	2.5	0.698	$ -	$ 850.00
HWT 0.80 UEF to HWT tankless condensing 0.95 UEF	1.91	0.097	$ 27.11	$ -
Below Grade Wall R20 Blanket to R22 2x6 16"oc + R10	1.79	0.091	$ 25.05	$ 850.00
No DWHR to DWHR 60% 2 showers	1.36	0.069	$ 19.14	$ 1,300.00
No slab insulation to R10 Thermal break and underslab	1.26	0.064	$ 17.68	$ 1,500.00
No DWHR to DWHR 42% 2 showers	0.96	0.049	$ 13.59	$ 850.00
HRV 65 vs HRV 75%	0.86	0.023	$ 15.51	$ -
R60 to R70	0.46	0.024	$ 6.44	$ 250.00

Conclusions and Observations

Efficiency targets and building codes

- The NBC 2020 Tiered Energy Code may not see full adoption into the industry before 2024. **Any DSM programs between 2020 and 2024 will likely be benchmarked against the existing 2017 OBC SB12 and SB10.**

- Given the solidified recognition of "Net Zero Ready" in the NBC 2020 Tiered energy code(Tier 5), the growing number of municipalities developing CEP's/MEP's with Net Zero –like targets and aspirational goals, and the current Canadian Homebuilders Association (CHBA) Net Zero Ready Hometm volunteer labelling program, **any DSM programs involving resource acquisition or market transformation should support the advancement of net zero ready housing technologies, construction practices, consumer awareness /literacy and ultimately community scale development**

- As homes move towards tier 5 /Net Zero ready load profiles change substantially. Ultimately, opportunities to impact annual operational savings for homeowners through reduced fuel use becomes more difficult as space heating loads diminish. Overall, load profile changes that may affect NG based appliance use in new homes may include:
    - **Domestic Hot Water will become the largest operational load** for homes designed to the upper tiers 4 & 5. This may result in:
        - More use of Combo/Combinations, domestic hot water/space heating systems, and equipment
        - Increased use of Drain Water Heat Recovery
        - 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
    - **Space heating loads will be reduced** for homes designed to upper tiers 3,4,5,
        - Small space heating equipment
        - More use of Combo/Combinations domestic hot water/space heating systems and equipment

- Lower loads enable more efficient use of air source heat pump technologies, if even for part load conditions.

- **Cooling loads are growing in homes** – Tiers 1-5
  - AC is a standard in most homes
  - Higher cooling loads (more windows, occupant expectations, and more)
  - Cold climate ASHP systems will compete with NG space heating + Air conditioner systems.

CEP/MEP Community/Municipal Energy Plans

- Market transformation at the community scale is possible if ENBRIDGE is able to engage earlier in the development process. **The ideal timing for ENBRIDGE to engage with a developer is while the development team is creating submission for draft plan approval DPA**.
- Currently ENBRIDGE and all other utilities are notified by municipal planning departments to provide technical comment/review during the DPA process. The feedback by utilities is generic in nature, simply identifying if servicing access is available. **There is opportunity for ENBRIDGE / Utilities to "flag" these DPA submissions as opportunities to engage developer and the municipality in discussion around community energy design alternatives**. Anecdotally, several developer/builders surveyed mentioned that the standard ENBRIDGE answer to DPA submission review is simply " *Let us know when the final servicing designs are done".* In reality, It is the perfect time for ENBRIDGE to respond with new solutions or engage in discussion around grid/energy alternatives, optimizing on site energy production or storage, and more.
- It should be noted that **once a development receives Site Plan Approval SPA it is then too late to make changes to specs, designs and amenities.** Site plan approval SPA often signals the commencement of the Sales process.

Builder / Developer Survey Highlights

- Builder/Developers identified the following list of key challenges facing the adoption of tier 5 net zero ready communities .(See comments in the accompanying document ***"Future Energy Codes, Trends, Technologies: Builder / Developer Survey") .*** These are also areas wherein ENBRIDGE can assist through market transformation programs
  - **Affordability and cost of home ownership.** To make the transition to NZR homes, the industry needs proper financial mechanisms and tools (e.g. appraisal tools) which account for Total-Cost-Of-Ownership: e.g. Total monthly expense of Mortgage, taxes, and utilities.
  - **Marketing and Sales**: 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.
  - **Natural resistance to change.** The residential construction industry struggles with making change, or transitioning to new technologies and new processes.
  - **Education and Learning**: Keeping up with code changes, standards updates, and technology advancements. Stakeholders such as designers, building officials, and BCIN designates will require significant time/education/training to move from the current Ontario based SB12/SB10 to the new NBC 2020.

- **Depleted Skilled work force**: The industry is feeling the effect of an ageing workforce and also struggles to bring new, young, skilled labor in.

- Builder/Developers identified the **most cost effective measures that can be used to make homes more efficient**
  - Advanced air tightness
  - Triple pane windows with ideal U & SHGC values
  - HVAC equipment right sizing and design
  - Continuous exterior insulation above grade AND below
  - OVE Optimum Value Engineering wood structure and components.
- Builder/Developers identified that 50%+< of new communities and product will be multifamily dwellings. There is a growing issue with affordability and land access/approvals which has driven further development of mid density product e.g. townhomes, back-to-back 3 story towns, 3 story MURB multi-unit residential buildings.

- Builder/Developers identified the most crucial risks in residential construction going forward are:
  - Exterior above grade water penetration
  - Interior moisture/humidity levels not being controlled properly (even when given hygrometer, education etc)
  - Material access/ cost of goods inflation
  - Lack of skilled trades.
  - Sound and Smell transfer between multifamily units.
  - Extreme weather events
  - Poor Air barrier performance
  - Radon

- Builder/Developers shared their **thoughts about <u>past</u> ENBRIDGE (or Union Gas legacy) DSM programs** such as Savings By Design SBD or Optimum Home OH.
  - *SBD WAS HELPFUL WHEN THE AGENDA INCLUDED PRELIM HVAC AND HVAC DESIGN WORK AND ALSO WENT INTO THE FIELD TO BENCHMARK PRACTICES: WATER MANAGEMENT, AIR BARRIER, ETC…*
  - *SBD ALLOWED US TO MAKE DECISIONS EARLY IN THE DESIGN PROCESS - BUT STOPPED SHORT OF HELPING IN THE FIELD / PRACTICAL APPLICATION OF CONCEPTS*
  - *DSM PROGRAM SHOULD PAY EVALUATORS DIRECTLY UP FRONT-NOT LATER OUT OF BUILDER "INCENTIVE"*

- Builder/Developers shared their **thoughts about how <u>future</u> ENBRIDGE DSM programs**
  - *TRAINING FOR STAFF And TRADES*
  - *NEW TECHNOLOGIES…*
    - *ALL IN ONE HVAC*
    - *BATTERIES /RENEWABLES*
    - *AIR SEALING TECH*
  - *SIMILAR TO SBD. MAYBE TARGET NZR (in lieu of 20% over OBC)*
  - *PROGRAMMING THAT IS DEVELOPED FOR DEVELOPMENT SIDE OF BUSINESS*
  - *MUST BE INVOLVED AT DRAFT PLAN APPROVALS STAGE AND EARLIER! PROVIDING SERVICES AND SOLUTIONS AHEAD OF TIME TO BOTH MUNICIPALITIES AND DEVELOPERS DURING /BEFORE THE DRAFT PLAN APPROVALS PROCESS.*
  - *GIVE ME TIME(CONSULTING,TRAINING) FIRST…AND THEN MONEY/FREE STUFF, SECOND- BOTH WOULD BE GREAT*
  - *CONCERN WITH COST OF MODELING AND QA COMING OUT OF $2000 PER HOME FOR SBD. NEED TO KNOW MORE OF THIS UP-FRONT FROM UTILITY AND CONSULTANTS..*

REFERENCE 1

WHO IS APPLYING 2015 9.36 or an "Energy Code" IN CANADA ?

Most of the provinces and territories have adopted NBC 9.36:

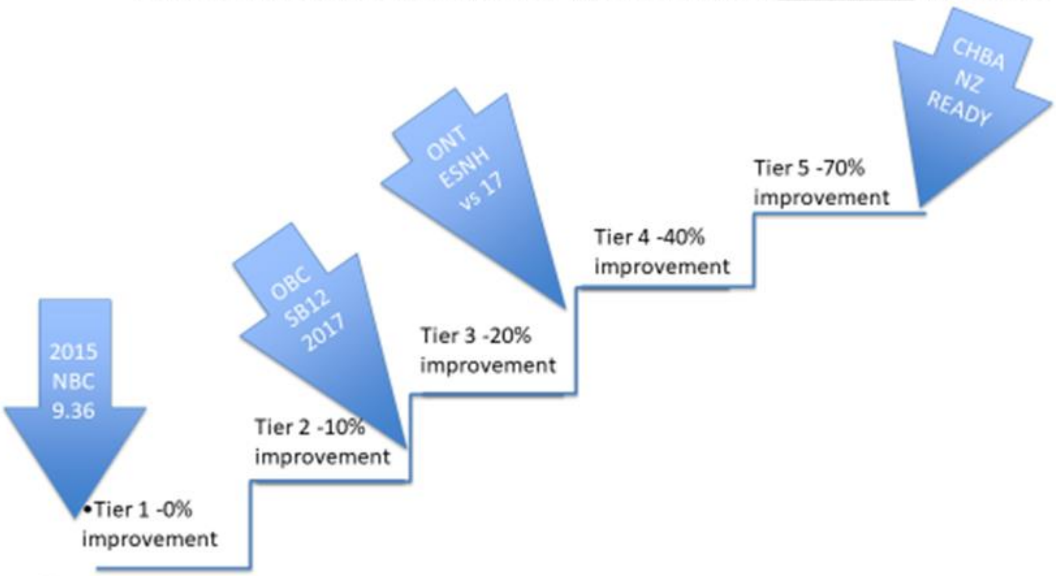
- British Colombia – NBC 9.36 + BC Step Code.
- Alberta– NBC 9.36.
- Saskatchewan– NBC 9.36.
- Manitoba – NBC 9.36.
- **Ontario – Ontario Building Code SB-12.**
- Quebec – Quebec energy code .
- New Brunswick– NBC 9.36
- PEI– NBC 9.36
- Nova Scotia – NBC 9.36
- Newfoundland (organized municipalities) – NBC 9.36.
- Yukon, NWT – NBC 9.36.

WWW.BUILDINGKNOWLEDGE.CA

REFERENCE 2

Proposed NBC 2020 9.36 Energy Code Tiers

NOTE: Baseline is current 9.36 performance(Current NBC 9.36 is LESS efficient than OBC SB12 2017)*



WWW.BUILDINGKNOWLEDGE.CA

REFERENCE 3

Example Heat Loss /Heat Gain Loads
Space conditioning loads in Net Zero Ready / Tier 4-5 residences

Three-storey, town	Two-storey, detached	Single-storey, detached	Two-storey stacked back-to-back town
Image used with builder's permission	Image used with builder's permission	Image used with builder's permission	Image used with builder's permission
Description: • 1,600 sf on 3 floors plus basement • Front facing E (highest cooling) • Energy Star certified	**Description:** • 1,400 sf on 2 floors plus basement • Front facing W (highest cooling) • Energy Star certified	**Description:** • 1,300 sf bungalow plus basement • Front facing NW (highest cooling) • Energy Star certified	**Description:** • 1,100 sf on 2 floors • Front facing SW (highest cooling); Units A & B share an entrance • Energy Star certified
Design Loads: (for mid unit)	**Design Loads:**	**Design Loads:**	**Design Loads:** (for upper-mid unit)
Greater Toronto Area, ON DHL: 15,786 Btu/h DHG: 19,192 Btu/h	**Greater Toronto Area, ON** DHL: 16,547 Btu/h DHG: 18,556 Btu/h	**Greater Toronto Area, ON** DHL: 20,335 Btu/h DHG: 19,354 Btu/h	**Greater Toronto Area, ON** DHL: 6,901 Btu/h DHG: 13,850 Btu/h
Ottawa, ON DHL: 17,721 Btu/h DHG: 18,807 Btu/h	**Ottawa, ON** DHL: 18,573 Btu/h DHG: 18,147 Btu/h	**Ottawa, ON** DHL: 22,862 Btu/h DHG: 18,655 Btu/h	**Ottawa, ON** DHL: 7,984 Btu/h DHG: 14,067 Btu/h

WWW.BUILDINGKNOWLEDGE.CA

ABOUT BUILDING KNOWLEDGE CANADA INC.

Building Knowledge Canada (BKC) originally began in 1986 as a division of Air Solutions, then incorporated independently in 2009. BKC is the largest residential energy evaluation / home performance company in Canada with over 43,000+ high performance home evaluations/ratings completed across Canada since its creation.

The firm specializes in practical building science for residential buildings/homes including energy modeling, enclosure and HVAC design and forensics, indoor air quality & thermal comfort design , air tightness testing & air barrier design and forensics, , HVAC residential commissioning, enclosure water management detailing & forensics; All with the clear goal of achieving energy efficiency, envelope durability and occupant health and comfort.

Building Knowledge Canada is a leader in building performance strategies and an expert on the industry's cutting edge initiatives. BKC's credentials include qualifications in the following areas:

- Recognized Building Science Trainers: Natural Resources Canada
- High Performance Building Science Training for Builders, Trade Contractors, Architects, Sales-Marketing Teams, Real Estate Industry, Building Officials
- Building Science/Building Envelope Diagnostics & Testing
- Energy Software Modeling and Design Analysis including Hot 2000, Remrate, and Retscreen
- Building Code Compliance - NBC and OBC Energy Compliance: Performance/Prescriptive/Comparative
- Air Barrier/Tightness Detailing, Diagnostics and Evaluations
- CMHC Trained Indoor Air Quality Investigators: Training and Audits
- HVAC Design Review, System Diagnostics (HRAI Accredited Staff)
- NET ZERO Home Design Analysis, Modeling and Testing
- LEED
- ENERGY STAR®

BKC contributes its expertise in Building Science Training and Building Code Analysis for several industry partners including both Federal & Provincial public institutions and private manufacturer's of construction material and HVAC equipment
Currently BKC is providing Building Science/Energy Efficiency Training and Consultation for the following clients:

- CMHC Canadian Mortgage & Housing Corp
- CHBA Canadian Home Builders Assoc
- Natural Resources Canada
- NRCan LEEP Division
- ENBRIDGE
  EnerQuality Corporation
- Dupont / Dow
- Owens Corning
- Venmar VenEE
- Jeld-Wen
- EEBA Energy & Env Building Alliance
- New Brunswick Power
- BC British Columbia Housing
- OBOA Ontario Building Officials Association
- OHBA Ontario Homebuilders Association

BKC team members have been instrumental in the development of numerous industry standards (NRC, CSA, etc.) and participate on various building code and advanced housing program committees:

- CHBA Net Zero Home Council and Program Management Committee
- National Building Code -Standing Comm Energy and Buildings
- ASHRAE 90.2 Residential low rise Energy Efficiency Standing committee
- ENERGY STAR® for New Homes Advisory Committee and TAC Committee Chair
- CSA F280 -2012 Development and Committee Chair
- CSA TC 424: Energy Systems in buildings and homes
- Ontario Building Code Part 9 2012 Advisory Committee, Part 7, 3 and 12 Review committees

ENBRIDGE GAS LOW CARBON TRANSITION PROGRAM

Low Carbon Transition Program Strategy

Background

1. The Pan Canadian Framework on Clean Growth and Climate Change ("PCF") was designed to address Canada's continued commitment to meeting the emission reduction targets outlined in the Paris Agreement. The PCF calls for transitioning to new and higher efficient technologies. In support of the PCF, NRCan's report, "*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*"[1] ("Road Map") identifies market transformation needs for space and water heating to reduce energy use by at least 35% through leveraging next generation technologies. Utilities have been called to play an important role in this market transformation road map[2].

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 by addressing three key market barriers identified in NRCan's report:[3]
   - Accessibility - limited distribution and service providers supporting the sales, installation, and service of the technology.

[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. 3.
[2] Ibid, p. 77.
[3] Ibid, pp. 33-34.

- Awareness – knowledge and understanding of the technology and the potential to reduce energy consumption has yet to be widely understood in the markets to drive interest in adoption.
- Affordability – Premium up-front cost for the technology in relation to existing market solutions due to the limited distribution and competition in the Ontario marketplace.

3. The time horizon of NRCan's Road Map clearly indicates that it will take a long time to address these market barriers and reach the point where these technologies can be regarded as mainstream.[6] Enbridge Gas plans to accelerate this process by:
   - Engaging industry, municipalities, and other influential stakeholders that could support efficiency policy progression and equipment standard advancement;
   - Increasing product availability by demonstrating a need and interest from the market to distributors and manufacturers alike;
   - Reducing the current accessibility barriers for these low carbon technologies by providing significant up-front incentives; and,
   - Providing training to design engineers and contractors to ensure proper identification/specification of applications and quality installation of equipment.

4. In the process of developing this program, Enbridge Gas has consulted with a number of industry and government stakeholders for input on how best to support the transformation of this market and has received a number of letters of support in response. Please see Attachment 1.

Residential Heat Pump Program Offering

Objective

5. The objective of the Residential Heat Pump offering is to accelerate the adoption of hybrid heating systems and natural gas heat pumps by:

- increasing awareness, understanding and acceptance in the marketplace;
- training contractors to appropriately identify, sell, and install these solutions into homes; and,
- supporting the uptake of the technology into the market through the provision of incentives to customers to offset the increased cost of the solution when compared with current standard alternatives.

Target Market

6. The Residential Heat Pump offering will be available to all residential customers and HVAC contractors, subject to eligibility details outlined below.

Offering Details

7. Hybrid heating with smart controls combines the reliability and affordability of natural gas heating equipment, an electric air source heat pump (“ASHP”), and a smart control to manage the hybrid system. The smart fuel switching control evaluates system efficiency and activates the lowest cost heating option on an hourly basis. This approach saves on energy consumption and GHG emissions when compared to a traditional gas heating system. The overall operation of a hybrid heating system is designed to achieve greater than 100% efficiency.

8. Residential natural gas heat pumps are like their electric counterparts but are fueled by natural gas. These units would replace the existing furnace with an air handler while the connected gas heat pump unit will be located outdoors, similar to a typical air conditioning condensing unit. The efficiency achieved by these heat pumps will exceed 100%. Although available in other parts of the world, these systems are not currently available in North America for a typical residential application.

9. For the delivery of both hybrid heating with smart controls and the residential natural gas heat pump systems, Enbridge Gas will engage interested residential contractors that complete the requisite training to deliver the offering.

10. The development of standardized contractor training for unfamiliar technological solutions such as these is a key requirement to ensuring common installation mistakes are minimized.

11. To facilitate this, Enbridge Gas will work with third-party experts and manufacturers to provide technical support in both the design and delivery of this training.

12. Following the contractor's successful completion of the training, they will be eligible to proceed with selling and installing the respective technology, leveraging financial and program support provided through the Residential Heat Pump offering.

13. To support the installation of hybrid heating with smart controls, Enbridge Gas has proposed an incentive budget with consideration of discussions with manufacturers and contractors regarding incremental costs and the anticipated financial support required to drive early adoption. Enbridge Gas intends to monitor uptake throughout the offering and reevaluate incentive levels as required.

14. 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. As a result, installed costs for this technology are less certain at this time. Therefore participant incentives are currently high level estimates and will be refined when more data is available at the time of market launch.

Metrics

15. The offering will be measured on the following two metrics:
    - Number of homeowner installations completed by participating contractors;
        - an invoice will be provided by the contractor as proof of installation.
    - Number of residential contractors that successfully complete required sales and installation training and complete at least one project installation.
        - successful completion of the training will be demonstrated through the provision of evidence of attendance for each contractor participant; and,
        - an invoice will be provided by each contractor as proof of installation.

Eligibility Criteria

16. Residential Participants:
    - To be eligible for the offering, a participant must be a residential Enbridge Gas customer whose residence (which may include detached house, semi-detached, rowhouse, townhouse, or a mobile home with a permanent foundation) is heated with natural gas;
    - Participants must use a participating contractor; and,
    - Participants must have an active wi-fi connection in the residence.

Contractors:

- Contractors must have completed all necessary training and be eligible for installation of residential heat pumps in Ontario.

Impact Evaluation & Verification

17. Enbridge Gas recommends limited impact evaluation and verification for this offering in the near term, due to the offering's nascency. Verification could include a desk review of project files. Further impact evaluation should be assessed for appropriateness in the longer term.

Process Evaluation

18. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

Commercial Heat Pump Program Offering

Objective

19. The objective of the Commercial Heat Pump offering is to accelerate the adoption of natural gas heat pumps by:
    - increasing awareness in the marketplace;
    - training design engineers to identify appropriate applications for and specify these solutions into existing businesses; and,
    - supporting the uptake of the technology into the market through the provision of incentives to customers to offset the increased cost of the solution as compared with current standard alternatives.

Target Market

20. The Commercial Heat Pump offering will be available to all commercial customers and design engineers, subject to eligibility details outlined below.

Offering Details

21. Commercial gas heat pumps achieve efficiencies greater than 100% by using natural gas to do one of the following:
    - drive a compressor in a vapor-compression refrigeration cycle;
    - power an absorption refrigeration cycle which absorbs heat from one place to be released elsewhere; or,

- run a thermal compression system, which is a less common configuration than the previous two and is currently not available in Canada.

22. There are many different applications for commercial gas heat pumps but what they do have in common is that they are typically systems custom designed by engineers.

23. For the delivery of commercial natural gas heat pump systems, Enbridge Gas will leverage ESAs to identify and engage eligible customers, as well as work closely with the contractor and system design community.

24. As a primary method of promoting the offering, Enbridge Gas will seek to partner with gas heat pump manufacturers and equipment suppliers to influence the design community. HVAC manufacturers and their local representatives can be leveraged by Enbridge Gas to educate the design community and influence what they recommend and specify to their clients.

25. Enbridge Gas plans on partnering with equipment suppliers to develop and jointly deliver training sessions to expand the reach of existing efforts to promote gas heat pumps as a viable alternative to traditional systems that should be considered by participating design engineers. Enbridge Gas will fund the cost to develop training intended to be delivered to design engineers with no direct participant cost. The jointly developed training sessions will focus on the benefits of gas heat pumps, proper design criteria, and typical installation applications suitable for this technology.

26. To support the installation of commercial natural gas heat pumps, Enbridge Gas has made best efforts to estimate an incentive budget that will cover an appropriate portion of the installed cost to drive early adoption of these technologies. This analysis has been based on industry research and discussions with equipment

suppliers, however, there is some uncertainty about the incentive requirements due to the range of technologies and end use applications. Enbridge Gas will monitor uptake throughout the offering and reevaluate incentive levels as required.

Metrics

27. The offering will be measured on the following two metrics:
   - Number of installations completed by commercial customers
     - An invoice will be provided by the contractor as proof of installation.
   - Number of commercial design engineers that successfully complete required training and specify at least one system to adopt an applicable heat pump solution.
     - Successful completion of the training will be demonstrated through the provision of evidence of attendance.
     - Engineering design schematics will need to be provided as proof that a system was specified.

Eligibility Criteria

28. Commercial Participants:
   - To be eligible for the offering, a participant must be an Enbridge Gas commercial customer.[4]

System Designers:

   - Design engineers must be professional engineers designated to practice in the province of Ontario.

Impact Evaluation & Verification

29. Enbridge Gas recommends limited impact evaluation and verification for this offering in the near term, due to the offering's nascency. Verification could include a desk

[4] Commercial customers include MURBs, MUSH and other non-industrial businesses.

review of project files. Further impact evaluation should be assessed for appropriateness in the longer term.

Process Evaluation

30. Over the term of the plan, Enbridge Gas will explore process evaluation topics based on the evolving needs of the offering in the pursuit of continuous improvements to program design and delivery. The approach to process evaluation is discussed in Exhibit E, Tab 4, Schedule 5.

CLIMATECARE.

Tom Grochmal
Enbridge Gas

April 14, 2021

Dear Tom,

I am writing to express our support for the inclusion of hybrid-heat systems in your DSM program.

ClimateCare is a co-operative of approximately 30 Ontario HVAC contractors focusing on the residential retrofit market. Our members operate businesses from Windsor to Cornwall and north to North Bay, servicing over 70,000 households annually. The co-op has been in existence since 1992 and many of our members have been in business for more than 30 years.

We believe that the work that has been done by government[1] and academic[2] researchers demonstrates the effectiveness of hybrid-heat systems (heat pumps combined with forced air gas furnaces) in reducing greenhouse gas emissions. Heating contractors have experience specifying, installing and maintaining these systems in markets that have traditionally relied on propane or oil for heat and will be able to expand this offering to natural gas markets if the economic incentive is structured to overcome the initially higher equipment costs.

There is a potential for a significant lost opportunity if we do not move now, as carbon pricing increases the cost of natural gas in the coming years. Residential home comfort systems are typically on replaced every 12 - 15 years and in areas of Ontario serviced by natural gas, this generally means a forced air gas furnace with a central air conditioning system. Traditional furnace/AC systems installed today will represent a lost opportunity during their anticipated operating lifespan as the economics shift favouring heat pumps before equipment installed today is fully depreciated. This will leave homeowners with the choice of either paying more to heat their homes or choosing to replace functional equipment in order to reduce their heating costs. Conversely, incentivizing homeowners to choose a heat pump instead of an air conditioner now will “future proof” their system against rising carbon pricing and help reduce natural gas demand and GHG emissions.

I want to thank you and Enbridge for the opportunity to be involved in conversations around your DSM program design. These conversations help ensure that the concerns of the contracting community are built-in to the program and not an afterthought.

Sincerely,

Victor Hyman
Executive Director
ClimateCare Co-operative Corporation

[1]https://www.nrcan.gc.ca/simply-science/future-home-heating-hybrid-home-heating-systems-offer-energy-savings-and-reduce-ghg-emissions/22236
[2]https://www.researchgate.net/publication/331500660_Experimental_and_sensitivity_analysis_of_a_smart_dual_fuel_system_in_a_net-zero_energy_home

920 BRANT STREET, UNIT 10, BURLINGTON, ON L7R 4J1
TEL 905.319.9828 climatecare.com

HTS Toronto
115 Norfinch Drive
Toronto, ON M3N 1W8
T 1.800.850.0567
F 416.661.0100
hts.com/ontario

April 14, 2021

Octavian Ghiricociu, P.Eng, CEM
Sr. Advisor Technology
Enbridge Gas
918 South Service Rd
Stoney Creek, ON, L8E 5M4

Dear Octavian,

HTS is a professional HVAC commercial/industrial equipment sales agency, service and controls contractor for HVAC products and systems. Founded in 1992 in Toronto Ontario, HTS has since grown to over 800 staff in Canada and the USA.

HTS has been an active industry partner of Enbridge for the past few years and has recently been consulted by Enbridge on the design of the 2022 DSM Low Carbon Offer. We are generally supportive of the design of the offer and can see it being beneficial in expediting the market acceptance for gas fired heat pumps as a lower carbon solution for buildings.

Using a tried-and-true absorption refrigeration process, gas fired heat pumps can produce hot water with far greater efficiency than traditional gas appliances such as condensing boilers or hot water heaters (120-130% vs 90-96%). Gas fired heat pumps have been available for more than a decade but have yet to see substantial uptake in the Ontario market due to the market familiarity and availability of traditional boilers.

With many institutional organizations, private companies and municipalities in Ontario putting forth policies for long term carbon reduction, and with buildings being a major contributor to carbon emissions, technologies to help with carbon reduction in buildings are going to continue to become more relevant. Gas fired heat pumps are a great solution to help reduce carbon emissions in all buildings, new and old. There is an especially strong opportunity with the millions of existing buildings in Ontario, since gas fired heat pumps can be retrofitted to existing buildings without any major infrastructure upgrades that are typically required with building electrification. Decarbonizing our existing building stock is not something that can happen in months or years, but it will take decades. Power distribution infrastructure upgrades and energy reduction strategies need time to be fully deployed, so intermediate solutions are required to help with carbon reduction in buildings with minimal cost and without major infrastructure upgrades. Gas fired heat pumps are a tried-and-true technology that could have a major carbon reduction impact on Ontario's existing buildings with minimal cost and effort.

HTS is encouraged by the offer being proposed by Enbridge and are excited for how it should expedite the market acceptance for gas fired heat pumps as a lower carbon solution for buildings.

Sincerely,

Paul Pilutti P.Eng.
Director of Canadian Operations

2021-04-16

HVAC : Research and Development - "Hybrid" Heating Systems in Ontario

To Whom it may Concern,

Napoleon is proud to be recognized as one of Canada's Best Managed Companies and is dedicated to providing quality, home comfort products for over 40 years and counting; including grills, hearth and HVAC.

Napoleon is committed to the development of sustainable solutions that support the reduction of Green House Gases, (GHG's) and are actively developing several new technologies for residential heating; including natural gas based "hybrid" systems that have an efficiency over 100%.

As a part of this development activity, Napoleon is participating in the 2021 retrofit hybrid heating smart control pilot project, which has been organized by Enbridge. We believe that such consumer-based programs, (which also engage industry contractors), are a critical step to bring new technologies to market. From past experience, we know that laboratory testing and engineering field evaluations alone are not sufficient to drive consumer and industry interest, nor to get the necessary "real world" feedback to improve the product and potential adoption programs, prior to market launch.

Napoleon has also consulted with Enbridge, regarding the design of the proposed 2022 DSM Low Carbon Offer. After a detailed analysis, including our internal marketing teamand reaching out to our trusted industry partners, we believe that this program is a very appropriate tool to enable market transformation with gas hybrid heating systems in Ontario. We are supportive of such an approach and believe that it will make a credible difference in the marketplace.

At Napoleon, we believe the responsible and effective use of natural gas is essential in Ontario to meet short- and medium-term targets for emissions reduction. The improved efficiency and energy flexibility offered by hybrid gas electric heating systems not only will immediately reduce natural gas consumption; but will do so without financially penalizing the consumer as their monthly energy bills will be reduced. This is a compelling opportunity that will only be truly successful if provided with strong support during its infancy. We believe the programs Enbridge have designed are a great step towards driving market transformation.

Regards,

David Shulver
Vice President Research & Development

P: 705 721-1212 ext. 20515
E: DShulver@napoleon.com

DS/kr

LENNOX INTERNATIONAL

Lennox International Inc.
2100 Lake Park Boulevard
Richardson, Texas 75080-2254

Mailing Address:
P.O. Box 799900
Dallas, Texas 75379-9900

Telephone: 972.497.5000
Facsimile: 972.497.6668
LennoxInternational.com

Tim Brizendine
Director of Product Management
Residential Cooling Products
Telephone: 972.497.7541

April 19, 2021

Re: Enbridge DSM application for residential hybrid heating

Ontario Energy Board,

Lennox International Inc is supportive of Enbridge's plans to launch a multi-year incentive plan for hybrid heating (high efficiency heat pump combined with high efficiency gas furnace). This type of system will provide not only energy savings, but also comfort benefits for the homeowner as well as environmental benefits.

Lennox International will work with its dealer and distributor partners to participate in the program. We believe that the program is designed to have a wide impact across the market by promoting higher efficiency systems and driving awareness of hybrid systems to consumers and installers.

The goals of the program align well with the Lennox's desire to provide cost effective high efficiency comforts systems to consumers that provide a positive impact on the environment.

Sincerely,

Tim Brizendine

Tim Brizendine
Director of Product Management
Lennox International
Email: tim.brizendine@lennoxind.com

DSM PORTFOLIO

1. The following sections describe the proposed DSM budget for items that are not included within the Program Budget as shown in Exhibit D, Tab 1, Schedule 1, Table 3.

Administration Costs

2. This category contains $11.0 of the Portfolio Subtotal as shown in Table 3 of Exhibit D, Tab 1, Schedule 1, and is comprised of Portfolio Administration, System Maintenance & Improvements, and Municipal Engagement.

Portfolio Administration

3. This sub-category includes approximately $8.4 million of the Administration category above. This includes salaries of staff not directly allocated to program costs, expense, travel, training, industry memberships and subscriptions. Staff who can be primarily associated with program delivery have been directly allocated to the relevant DSM Program. A fulsome description of DSM staffing and Compensation costs spanning both the Program budgets and Portfolio Administration is described in Exhibit D, Tab 1, Schedule 1. This exhibit also describes the need for the one incremental headcount in Portfolio Administration that has been proposed for 2022 and the changes in total DSM compensation costs for the entire DSM Plan.

System Maintenance and Improvements

4. This sub-category is $1.0 million of the Administration category above. As part of Enbridge Gas's (formerly EGD and Union Gas) 2015-2020 DSM Plan (EB-2015-0049 and EB-2015-0029) Enbridge Gas developed and implemented new Tracking and Reporting Systems for both rate zones (2019 for EGD rates zone and 2018 for

UG rate zone). These systems are critical to the tracking, monitoring, evaluation and verification of DSM program offers and results.

5. It should be noted that both systems are relatively new and were designed to be flexible in order to allow the inclusion of new offers. The suite of offers being proposed by Enbridge Gas is similar enough to the existing suite of offers that the Company is confident the existing systems can continue to be utilized to track and report on our programs.

6. The systems will however continue to require on-going maintenance and upgrades similar to any technology information system, including but not limited to: licenses, system support costs, integration & environments, and ongoing core system upgrade costs.

7. In addition to ongoing costs, Enbridge Gas expects to continue to evolve the systems for a variety of reasons. First to accommodate new programs, as the Company broadens its reach to more customers, enhancements to the systems may be required to avoid increases to tracking and reporting related overhead costs. Second, the Evaluation Contractor has provided many recommendations over the years for improvements to the tracking and reporting systems. Many of these have been addressed with the implementation of the new tracking systems, but future recommendations may require further enhancements to the systems as a normal course of business. Finally, Enbridge Gas may identify future enhancements that would allow for productivity improvements, the benefits of which would either flow to customers as reduced overhead spend or increased program participation.

8. In 2020, the first year that year that both systems were fully operational, the costs for maintaining the system was approximately $806,000. In 2021, the costs forecasted for maintaining the systems are approximately $885,000. In 2022 Enbridge Gas

estimates it will require a budget of $1,000,000. The increase budget over 2021 is primarily driven by updates and enhancements the costs of which are expected to be higher as explained above. A breakdown of the System Maintenance & Improvements budget is set out in Table 1 below.

Table 1: DSM System Maintenance and Improvements

System Maintenance & Improvements	Budget
Licenses	$475,000
System Support Costs	$200,000
Integration & Environments	$75,000
Updates & Enhancements	$200,000
Other	$50,000
Total Budget	**$1,000,000**

Municipal Engagement

9. This sub-category includes approximately $1.63 million of the Administration category above.

10. Enbridge Gas is in a unique position as a utility that serves 340 of Ontario's 444 municipalities where approximately 100 of these municipalities are creating or implementing Climate Change Action Plans ("CCAP") or Municipal Energy Plans ("MEPs"). CCAPs and MEPs dissect current energy use and emissions and group them by source or sector. Plans are then created, and ambitious targets are set to reduce energy consumption and greenhouse gas ("GHG") emissions within a prescribed timeline. Municipalities typically set targets for the year 2050, with interim targets for the year 2030.

11. In addition to being key customers themselves, municipalities play the critical roles of "Influencer", "Promoter", "Enabler" and "Enforcer" of strategies, policies and

programs seeking to reduce the GHG emissions of their constituent residents, businesses and institutions, also our customers. In line with our DSM strategy of direct engagement with customers to help them achieve deep and lasting energy savings, we have an opportunity to further affect meaningful change through expanded partnership with these agents of community based GHG reductions.

12. Last year, in an effort to further support municipalities, Enbridge Gas formed a new Municipal Energy Solutions team to assist with the development and execution of municipal CCAPs and MEPs, leveraging existing DSM programs as a solution to reducing energy use and GHG emissions.

13. In the year since forming the Municipal Energy Solutions team we have seen that Municipalities are seeking the kind of leadership and financial support from Enbridge Gas that would lead to broader and deeper partnerships to lower energy costs and reduce energy use and GHG emissions. For this reason, the Company proposes increased support for Municipalities by engaging in the following activities:
    - **Energy Planning Consultation –** to develop and deliver sessions to support municipalities through the process of creating a CCAP or MEP and then the equally important step of creating an implementation plan with specific actions and programs through which these plans will achieve their targets (an area where we see a large disconnect at present)
    - **Financial Support** – to provide funding to help municipalities offset the costs related to the development of CCAPs or MEPs and/or their implementation
    - **Promotion of Collaborative Programs** – to aid the co-marketing of existing DSM offers, driving participation through collaboration with municipalities as influencers
    - **Web Development/Data Access -** to inform municipalities about the support and assistance that exists as they embark on their CCAP or MEP creation and to help fund the creation of tools enabling easier and faster access to customer

consumption data by sector, while still maintaining customer privacy requirements

- **Collaborative Initiatives and Programs** – to seed the creation of test programs or studies aimed to determine if there are incremental activities or technologies that would increase the successful achievement of these CCAP or MEP targets including the potential development of collaborative programming.

14. To support the aforementioned work, Enbridge Gas will continue to evolve its data analytics capabilities and tools to provide more municipalities with the data sets that would help them in identifying and reaching the targeted customer base in an efficient manner. Enbridge Gas will also coordinate its existing marketing efforts with municipalities support collaboration to customize and co-promote, as appropriate. This will maximize awareness and drive GHG reductions to benefit the homeowners, businesses, and institutions. Specifically, Enbridge Gas will support municipalities by:

- **Providing municipalities with require data sets**, leveraging Enbridge Gas' existing data and sourcing additional data, as required.
- **Creating a customized co-marketing plan,** including coordinating DSM and municipal promotional efforts to optimize outreach and drive maximum participation
- **Supporting development of municipal marketing strategies** leveraging Enbridge Gas' prior experience and data to target constituents with the highest savings potential or most likely to uptake efficiency measures.

Table 2: Municipal Engagement Budget

Item	Budget
Energy Planning Consultation	$330,000
Financial Support	$390,000
Promotion of Collaborative Programs	$330,000
Web Development/Data Access	$200,000
Collaborative Initiatives and Programs	$380,000
Total Budget	**$1,630,000**

DSM PORTFOLIO - EVALUATION AND REGULATORY COSTS

1. This category contains $3.8 million of the Portfolio Subtotal as shown in Exhibit D, Tab 1, Schedule 1, page 12 and consists of EM&V, Regulatory & Stakeholdering, and Process & Market Evaluation costs.

EM&V

2. This sub-category includes $2.6 million of the Evaluation and Regulatory budget category. Evaluation, Measurement and Verification ("EM&V") are costs associated with the OEB Staff led impact evaluation of the DSM portfolio and associated costs. EM&V is described in more detail in Exhibit E, Tab 4, Schedule 5. The estimated funding does not include any utility costs. In addition to the costs associated with the Impact Evaluation and Annual Verification, this would include costs associated with the Evaluation Advisory Committee as well as any evaluation studies undertaken by OEB Staff. Enbridge Gas also proposes that OEB led studies such as the Achievable Potential Study be included in this budget. As the costs are controlled by OEB staff, Enbridge Gas expects that any over/underages from the forecast will be collected/returned to ratepayers through the DSMVA on an annual basis.

3. Enbridge Gas notes that in some jurisdictions, the EM&V budget is set based on a percentage of the total budget. 3% is not an uncommon figure. By comparison, the budget here of $2.6 million is modest but it is reflective in part of the new and expanded programs that will be undertaken and the likely need for new and enhanced EM&V.

Regulatory and Stakeholdering Costs

4. This sub-category includes $0.7 million of the Evaluation and Regulatory budget category. The proposed costs are intended to cover the cost of regulatory

applications before the OEB related to DSM, including annual clearance proceedings, annual rate filings, any application(s) for the mid-term assessment, and any significant DSM related involvement in other proceedings, such as Leave to Constructs and IRP. This will also cover the costs associated with the annual DSM stakeholder meeting, as described in Exhibit E, Tab 4, Schedule 6.

5. For the 2015-2020 period, Enbridge Gas has incurred on average annual OEB cost and Intervenor cost claims of approximately $0.4 million per year, with costs varying year over year with a high of over $1.3 million depending on the year. The Company notes that there appears to be a trend towards higher levels of intervention with respect to DSM over time. Enbridge Gas must also incur external legal fees which are generally proportional to the corresponding Intervenor cost claims. As well, it should be noted that in the prior 2015-2020 DSM Plan, Enbridge Gas did not hold annual DSM Stakeholder meetings as is being proposed for this DSM Plan (see Exhibit E, Tab 4, Schedule 6). Enbridge Gas forecasts that the annual DSM Stakeholder Day would need an annual budget of approximately $40,000.

6. These four categories, namely OEB costs, intervenor costs, external legal fees, and stakeholdering costs, make up the $0.7 million being proposed as part of the Evaluation and Regulatory budget. This estimated funding does not include any salary or overlap of other costs included elsewhere in the budget. Since many of the costs in this sub-category are externally driven and can vary significantly, Enbridge Gas proposes that any over/underage's from the forecast will be collected/returned to ratepayers through the DSMVA on an annual basis and that the budget will not be used for other purposes without OEB approval.

<u>Process and Market Evaluation</u>

7. This sub-category includes $0.5 million of the Evaluation and Regulatory budget category above. The purpose of this funding is to cover the costs associated with

doing ongoing process evaluations of DSM offerings, work related to characterization of market uptake of conservation measures within Ontario and any other Utility led evaluation studies. Process evaluation is described in more detail in Exhibit E, Tab 4, Schedule 5. The estimated funding does not include any salaries and does not overlap other costs included elsewhere in the budget.

DSM PORTFOLIO – RESEARCH AND DEVELOPMENT COSTS

Research and Development Costs

1. This category contains approximately $3.2 million of the Portfolio Subtotal as shown in Exhibit D, Tab 1, Schedule 1, page 12.

Research and Innovation Fund

2. This sub-category includes $2.6 million of the Research and Development budget. This represents an amalgamation of the previously approved Research, Pilot, and Collaboration and Innovation funds escalated by a small amount over the 2021 OEB approved budget. Table 1 shows the historical spend and budget for the amalgamated utility. The purpose of the Research and Innovation Fund is described in below.

Table 1
Research Innovation Fund

2020 Actual	2021 Budget	2022 Proposed
$2,171,437	$2,543,663	$2,550,000

3. In the 2015-2020 DSM Multi-Year Plan and subsequent 2021 DSM Plan, the Company had access to OEB approved funding in the Research budget and Pilot budget (applicable to the Union rate zones) in addition to the Collaboration and Innovation Fund (applicable to the EGD rate zone). Activities supported through these funds were intended to support the objectives and guiding principles of the 2015-2020 DSM Framework and remain relevant to the energy efficiency landscape in Ontario. For the DSM Plan, Enbridge Gas is proposing a continuation of the funding approved for the 2015-2020 Multi-Year DSM Plan and 2021 DSM Plan, in an amalgamated Research and Innovation Fund ("RIF").

4. The energy efficiency landscape has changed dramatically in the last decade. There are new government policies to aggressively pursue the reduction of energy consumption and emissions, including the federal Pan-Canadian Framework on Clean Growth and Climate Change, the provincial Made-in-Ontario Environment Plan, and many local municipal energy plans. These policies are calling for enhancements to energy codes and equipment energy performance standards, propelling the long-term direction for the market. Enbridge Gas recognizes the importance and positive benefits of these activities.

5. The Company understands that it is a crucial time to move up the innovation adoption curve for energy efficiency technology, and Enbridge Gas believes it has a central role to play in advancing the research and innovation necessary to support energy transition through the ongoing evolution of energy efficiency technology. The Company is well positioned to support technology advancement including through testing and validation of the performance of emerging technologies and conducting field demonstrations and pilots.

6. Through DSM programming, Enbridge Gas has been able to play a key role in helping to influence the market to increase the adoption of energy efficiency technologies and practices. Currently, as a result of higher energy efficiency baselines (in part due to twenty-five years of successful DSM programming), there is an increasingly smaller opportunity to continue to generate savings using the same technologies and practices as done historically. Enbridge Gas must be able to maintain a focus on innovation, pilot programs, research, and collaboration across the industry in order to continue delivering DSM programming in Ontario that drives high levels of cost-effective energy savings, in support of the objectives of government.

7. The purpose of the RIF is to sustain and grow the opportunities in the existing DSM portfolio by investigating new measures and innovative program designs; identifying

technical and market barriers of new energy efficiency opportunities; testing new concepts; and, sustaining and updating technical resources. The RIF is also intended to support the current objectives outlined by the OEB in their DSM Letter, the guiding principles outlined in the Proposed Framework, and to be responsive to the ever-changing energy landscape in Ontario.

8. Ultimately, the goal of all activities funded through the RIF will be in support of the OEB's primary objective, "Assisting customers in making their homes and business more efficient in order to help better manage their energy bills."[1] In addition, the activities funded through the RIF are intended to address the following guiding principle outlined in the Proposed Framework:

   - DSM plans should support innovation, technology development and adoption of lower-carbon alternatives to enable longer term energy efficiency and conservation opportunities, consistent with the advancement of provincial policy goals.[2]

9. The role of the utility in energy efficiency research and innovation is well documented. The 2018 Energy and Mines Ministers' Conference released a report entitled "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," in which they identify the seven road map key activities intended to address market barriers and "pave the way to broad market adoption of next-generation, clean technologies needed for a low carbon building sector."[3] The report further outlines the stakeholders' roles in each key activity. The following graphic

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[2] To reflect direction outlined in A Made in Ontario Environment Plan, Ministry of the Environment, Conservation and Parks (November 29, 2018), p. 18; "our government will focus on smart regulatory and policy approaches to facilitate and enable innovation rather than hindering it.".
[3] Paving the Road to 2030 and Beyond: Market transformation road map for energy efficient equipment in the building sector, Energy and Mines Ministers' Conference (August 2018), p. 3.

highlights the utility's ability to be in a leading or supporting role for research and development for product development, research and development for laboratory and field testing, and demonstration.[4]

	Key Activities						
Stakeholder	R&D for Product Develop-ment	R&D for Laboratory and Field Testing	Demon-stration	Information & Awareness[74]	Training	Incentives	Codes & Standards[75]
NRCan	●	●	●	●	•	•	●
Provincial and Territorial Governments	•	•	●	●		●	●
Federal Laboratories	●	●					
Research Organizations	●	●					
Utilities / Efficiency Organizations	•	●	●	●	•	●	
Manufacturers	●	•	•	•	●		•
Builders / Contractors			•	•	•		
Industry Organizations[76]	•		•	●	●	•	•
Codes / Standards Organizations				●			●

● denotes leading role and • denotes supporting role for key activities.

10. Heat pump technologies are a perfect illustration of how a new innovation can progress through the road map key activities outlined above. As a result of research that was funded through the Research budget, Pilot budget, or Collaboration and Innovation Fund over the course of the 2015-2020 DSM Plan, Enbridge Gas is now poised to deliver the Low Carbon Transition program (detailed in Exhibit E, Tab 3, Schedule 1), with its focus on heat pump technologies, in the proposed DSM Plan. Through delivery of this program, Enbridge Gas is positioned to play an important role in providing information and awareness, and training, and through the support of implementation incentives.

11. Research and innovation funding, to support the evolution of DSM programming, is also common among other leading jurisdictions, including California and British Columbia.

[4] Paving the Road to 2030 and Beyond: Market transformation road map for energy efficient equipment in the building sector, Energy and Mines Ministers' Conference (August 2018), p. 77.

12. In California, gas and electric utilities are collaborating to deliver the Emerging Technologies Program.[5] This program is intended to "help fill the pipeline of new energy efficiency ("EE") measures by supporting technology advancement, validating the performance of emerging technologies ("ETs") and conducting field demonstrations."[6]

13. Similarly, Fortis BC recently introduced the Clean Growth Innovation Fund[7], and the IESO's previous Conservation Fund which is now the Grid Innovation Fund, recognizes the changing focus of the work from conservation to demand reduction.[8]

14. Enbridge proposes to use the RIF to better understand and address technical and market barriers of energy efficiency opportunities by supporting activities in four areas: innovation, pilot programs, research, and collaboration.

<u>Innovation</u>

15. In part, Enbridge Gas will use the RIF to investigate new measures and innovative program designs to address local DSM market needs. This includes studies to evaluate technology trends, the impacts of standards specifically related to new technologies and corresponding gas savings results, and innovative program design.

16. Enbridge Gas will work towards developing emerging technologies through lab testing and market research, in preparation for demonstrating projects through pilot programs.

---

[5] https://ca-etp.com/
[6] Hornquist, et.al, The Power of Ten: A Decade of Growth for Emerging Technologies Programs in California, ACEEE Summer Study on Energy Efficiency in Buildings (2014), p. 1.
https://www.aceee.org/files/proceedings/2014/data/papers/5-1143.pdf
[7] https://www.fortisbc.com/about-us/climate-leadership/clean-growth-innovation-fund
[8] https://www.ieso.ca/en/Get-Involved/Funding-Programs/Grid-Innovation-Fund/Overview

Pilot Programs

17. Pilot programs will be used to test new program concepts or modifications to existing programs in order to test technical performance and learn how to address market barriers. The goal of testing new or modified program concepts on a pilot scale is to inform an eventual rollout of the technology or practice into Enbridge Gas's DSM portfolio.

Research

18. Activities funded by the RIF will also include research required to more consistently and accurately estimate the natural gas savings generated through DSM program delivery.

19. Enbridge Gas conducts research on new and current Technical Reference Manual ("TRM") measures in support of the Technical Reference Manual Maintenance and Update Process, as described in the EC's November 2, 2017 document. As outlined in Exhibit C, Tab 1, Schedule 1, Section 8.5 of the Proposed Framework, this research is provided to the EC for their review and inclusion in the TRM.

20. In some cases, it may be appropriate to change the program delivery of a measure from a custom approach to a prescriptive midstream or downstream approach to facilitate more widespread participation. In these instances, Enbridge Gas would conduct research to determine an appropriate substantiation document for inclusion in the TRM.

21. In addition, Enbridge Gas conducts desktop and field measurement research to develop and maintain calculators and modelling tools to estimate natural gas savings for custom offers.

Collaboration

22. For the purposes of the RIF discussion, it is important to define the use of the term collaboration. Beyond the previous framework, where collaboration was typically used to refer to calls for Enbridge Gas to work with the IESO on CDM/DSM program collaboration, in the RIF discussion, Enbridge Gas is referring to potential collaboration with all external efforts or entities (which may include CDM and the IESO) in activities aligned with innovation, pilot programs, and research.

23. Enbridge Gas will continue to leverage all complementary efforts, including energy efficiency innovation activities by external organizations such as the IESO, private industry, industry trade organizations, corporate laboratories, NRCan and regional, national and international partners including utility, academia, non-governmental organizations, and other market stakeholders. Through these partnerships and memberships, Enbridge Gas will gain access to information on current issues, market assessments, emerging technologies, and new program efforts, leading to more opportunities and more effective delivery of DSM programming.

Market Data

24. This sub-category includes approximately $0.62 million of the Research and Development Cost category above. The purpose of this funding is to cover the cost of external tools, subscriptions and datasets of information that allow segmentation and classification of customers, including demographics, industry and building stock information. These tools and datasets are utilized to identify potential participants that may be well suited to DSM program offerings, provide relevant benchmarking information and inform programs about potential areas of opportunity for energy savings.

COORDINATION OF NATURAL GAS DSM PROGRAMS WITH CDM PROGRAMS & THIRD PARTIES

Coordination with CDM Programs

1. The OEB's DSM Letter provided direction that Enbridge Gas should

> endeavor to coordinate the delivery of DSM programs with electricity CDM programs where possible, including modifying the participant eligibility requirements of its current low-income program in order to be consistent with the electricity income-tested CDM program eligibility requirements. The centralization of electricity CDM programs under the IESO may lead to new opportunities for DSM-CDM collaboration and a greater level of overall energy savings. The OEB expects Enbridge Gas to file evidence addressing linkages to the new electricity CDM framework and to identify opportunities for efficiencies, program cost reductions, and increased natural gas savings.[1]

2. The Minister of Energy, Northern Development and Mines also provided direction in the CDM Framework that "to the degree reasonably practicable, the IESO will coordinate the delivery of the CDM programs with entities delivering natural gas Demand Side Management programs."[2]

3. To reflect this direction, the Proposed Framework includes the following guiding principle: "Where appropriate, Enbridge Gas should coordinate DSM and electricity CDM efforts to achieve efficiencies."[3]

4. With CDM programming now centrally managed by the IESO, Enbridge Gas no longer has the challenging task of coordinating with more than 70 separate electric LDC/CDM Plans across the province. However, to enable Enbridge Gas and the IESO to effectively explore coordination of DSM and CDM program delivery, Enbridge Gas requires regulatory support in a DSM Framework that is adaptive to allow parties to be responsive to opportunities as they arise.

---

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.
[2] https://www.ieso.ca/en/Corporate-IESO/Ministerial-Directives/2021-2024-Conservation-and-Demand-Management-Framework
[3] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 3, p. 7.

5. In support of this requirement, the Proposed Framework includes a clear policy for the Attribution of Benefits between Enbridge Gas and the IESO: "For electricity CDM and natural gas DSM programs jointly delivered with rate-regulated electricity distributors, all the natural gas savings should be attributed to rate-regulated natural gas utilities and vice versa for electricity savings. This represents a continuation of the simplified approach adopted in the 2006 Generic Proceeding and continued in the 2012 DSM Guidelines."[4]

6. Attempts to coordinate program delivery between natural gas DSM and CDM programs is beneficial to customers across the province. Harmonized delivery has the potential to create cost-efficiencies resulting in program cost savings to rate payers, can help to maximize incremental gas and electric energy savings within homes and buildings, minimizing lost opportunities. Coordinated delivery also provides a convenient "one-stop-shop" experience for customers, reducing marketplace confusion regarding 'who offers what' incentive. Such efforts would broadly support the province's policy objectives with a more integrated approach to helping combat climate change with energy conservation.

Present Coordination with CDM

7. At present, Enbridge Gas and the IESO have several coordinated DSM and CDM program offerings in market to serve customers in the commercial, institutional, and low income sectors. The following is list of some of the current efforts:
   i. Capability Building and Training (2018-Present), Commercial Sector
      This training initiative began in 2017 and became a joint initiative in 2018 between the IESO, Union and EGD. Participants receive incentives for attending "Dollars to $ense Energy Management Workshops", Building Operation Certification, and Certified Energy Manager Training to promote natural gas and

[4] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, Section 7.5, p.22

electric energy efficiency education and action. Enbridge Gas and the IESO intend to continue this coordinated initiative post-2021.

ii. Energy Manager Program (2020-Present), Institutional Sector

The IESO's Energy Manager program provides institutional customers with funding to employ a full-time Energy Manager with the strategic and technical expertise to recommend energy-saving equipment and technologies and implement an energy management strategy for the business. Enbridge is collaborating with the IESO on this initiative by contributing program funding to support adding a natural gas savings target for participants. This collaborative effort aims for a whole facility approach to energy management with consideration of both natural gas and electric energy savings potential.

iii. Midstream Prescriptive (2020 - Present), Commercial Sector

Enbridge Gas launched the Commercial Midstream offer in 2019 to encourage distributors to sell higher efficiency HVAC and food service equipment to their customers. In 2021, the IESO joined the offering by including incentives for three additional electrical foodservice measures. With the inclusion of incentives from the IESO, distributors are more engaged in the offer to sell high efficiency equipment. Enbridge Gas and the IESO intend to continue this coordinated initiative post-2021.

iv. Demand Control Kitchen Ventilation ("DCKV") (2020-Present), Commercial Sector

Enbridge Gas launched its DCKV direct install offering in late 2018, providing a turnkey solution for customers to improve kitchen ventilation with energy efficient DCKV technology. In 2020, this offer was jointly delivered with the IESO, providing customers with a single point of access to gas and electric incentives.

v. Sustainable Schools Benchmarking Program (2020-2021), Institutional Sector

Enbridge Gas and the IESO partnered with Sustainable Schools in an initiative which focused on benchmarking data to identify schools with high energy savings potential to encourage the development of site-specific action plans for gas and electric energy savings opportunities. In all, six separate school boards participated. This work has been important in the development of the proposed Whole Building P4P offering put forward in the DSM Plan.

vi. Adaptive Thermostats (2021- present), Residential Sector

Enbridge Gas has aligned the participant eligibility requirements of its low income programming with the IESO to create consistency between DSM and electricity income-tested CDM program eligibility requirements. Enbridge Gas has also included a second tier of income eligibility criteria beyond the Low Income program, in line with the IESO's Energy Affordability Program. Enbridge Gas intends to provide an enhanced incentive for Smart Thermostats to natural gas customers who income-qualify in the Tier 2 category of the IESO's Energy Affordability Program providing additional assistance to customers needing additional financial support to act on energy efficiency opportunities.

Planned Coordination with CDM

8. Stakeholders have been supportive of Enbridge Gas working with the IESO to align income eligibility criteria for low income programming with the IESO's electricity income-tested CDM program eligibility requirements. Aligning program eligibility criteria is the first step towards facilitating coordinated delivery. Discussions are currently underway between Enbridge Gas and the IESO to establish a province wide coordinated delivery model for the respective natural gas and electric single-family low income offerings. Until such time as details are final, Enbridge Gas is not able to provide further information in this Application.

9. Enbridge Gas will continue to explore opportunities to coordinate with the IESO across the commercial and industrial sectors. Enbridge Gas expects that some of its existing initiatives to coordinate delivery with the IESO, as noted in the previous section, will continue. Enbridge Gas will also explore new opportunities throughout the Proposed Framework. For example, Enbridge Gas views the Energy Performance program as an opportunity for coordination with the IESO. Enbridge Gas consulted with the IESO in the design of the Whole Building P4P offering and structured the offering to enable coordinated delivery with the IESO's Energy Performance program.

10. At the time of submission, the IESO is stakeholdering for the development of an on-reserve Indigenous CDM program for commercial and institutional buildings owned and operated by Band-Council. Once this CDM program is in market, Enbridge Gas will look for opportunities to coordinate with the IESO to serve its mutual on-reserve Indigenous customers through the DSM Commercial Program.

Coordination with Other External Parties

11. The Proposed Framework includes the guiding principle that "the gas utility should not have a disincentive to coordinate DSM efforts with external energy conservation and carbon reduction initiatives.[5]" The Proposed Framework also includes a clear policy for the 'Attribution of Benefits between Enbridge Gas and Other Parties:[6] "Attribution of savings between rate-regulated natural gas utilities and other parties (e.g., governments, non-rate-regulated private sector, etc.) should be based primarily on the shares established in a partnership agreement reached prior to the program's launch."

[5] EB-2021-0002, Application, Proposed Framework, Exhibit C, Tab 1, Schedule 1, p. 8.
[6] Ibid, p. 22.

12. With more than twenty five years of delivering natural gas DSM, Enbridge Gas has built broad program infrastructure, brand recognition and customer trust, and has the market knowledge and experience to drive successful outcomes through coordination of DSM activities with external conservation, sustainability and carbon reduction initiatives.

13. Throughout the term of the DSM Plan, Enbridge Gas is anticipating opportunities to work with other external parties, including government agencies, municipalities and consumer organizations to optimize funding, resourcing, administration and marketing of complimentary programming to drive incremental participation and leverage efficiencies. Discussions on some of these potential efforts have already been initiated, however Enbridge Gas is not yet able to make details of any arrangements public as they are not final.

DSM PORTFOLIO

EVALUATION TOPICS

EM&V Protocols Proposal

1. Over the course of the 2015-2020 DSM Framework, more than $10M of ratepayer funding has been spent on DSM evaluation activities, including:
   - Impact evaluation and verification studies and assessments (net-to-gross studies, custom project savings verifications, annual EC review of programs, etc.), coordinated by the OEB;
   - TRM maintenance and updates, coordinated by the OEB;
   - Process evaluation activities, coordinated by Enbridge Gas; and
   - Non-utility stakeholder and independent expert engagement costs (i.e., EAC).

2. With significant ratepayer spending expected to continue in support of evaluation activities, it is critical that the OEB, Enbridge Gas, and stakeholders are confident these activities are executed effectively and efficiently. In addition to the Evaluation Governance Terms of Reference discussed in Section 8.7 of the Proposed Framework, which ensures clear roles and accountabilities for those involved in DSM evaluation activities in Ontario, it is imperative that DSM evaluation protocols are developed and maintained. Enbridge Gas is requesting that the OEB direct OEB Staff to coordinate the development of Ontario DSM evaluation protocols, with engagement from Enbridge Gas and the EAC, with an initial version to be completed by December 31st, 2022.

3. The development and maintenance of Ontario DSM evaluation protocols would provide:
   - Clarity on how and which evaluation methodologies are used in Ontario. This clarity is important to:

- Enbridge Gas's program design and delivery efforts, to ensure they are executed in a manner which appropriately considers the evaluation methodologies;
- Current and future Evaluation Contractors, to ensure they are effectively and appropriately executing evaluation activities;
- The OEB and stakeholders, to ensure they are engaged with, understanding of, and can contribute to the evaluation methodologies; and,
- The greater DSM evaluation community beyond Ontario. While the OEB, Enbridge Gas, and stakeholders rely on information from other regulators and DSM program administrators, the development of Ontario DSM evaluation protocols would provide those parties with the Ontario perspective.

- A venue for the continuous improvement of evaluation methodologies in Ontario. Without evaluation protocols, it is difficult for Enbridge Gas, the OEB, or stakeholders to assess and ultimately improve DSM evaluation practices. Currently in Ontario, it is Enbridge Gas's experience that evaluation methodologies are generally determined by the status-quo historical practice, which may be outdated or sub-optimal. In some cases, evaluation methodology discussions occur among those involved in the OEB's evaluation governance structure (i.e., OEB Staff, the EC, Enbridge Gas, and the EAC) and a judgement can be made to incrementally adjust an existing evaluation methodology. However, without Ontario DSM evaluation protocols, the opportunity to more comprehensively assess and improve evaluation methodologies, has not been made available.

4. Although Enbridge Gas has been engaged in DSM under OEB frameworks since 1995, DSM evaluation protocols have never been developed. This is inconsistent

with other jurisdictions and program administrators, where evaluation protocols of varying degrees and styles exist. Some examples include:

- The New York State Energy Research and Development Authority ("NYSERDA")[1]
- The Independent Electricity System Operator ("IESO")[2]
- The State and Local Energy Efficiency Action Network ("SEE Action")[3]
- Arkansas[4]
- California[5]

5. For clarity, Enbridge Gas is not requesting the adoption of evaluation protocols from other jurisdictions or program administrators. These evaluation protocols have been developed for purposes relevant to other jurisdictions, and in some cases for other fuel types that fundamentally differ from natural gas. Furthermore, Enbridge Gas is not suggesting that Ontario DSM evaluation protocols should necessarily follow the structure, content, and scope of evaluation protocols from other jurisdictions or program administrators. In some cases, these evaluation protocols may be unnecessarily lengthy, and not focused on the critical issues that have the largest impacts on evaluation methodology effectiveness.

6. Instead, to be effective and efficient with ratepayer spending when developing and maintaining the Ontario DSM evaluation protocols, Enbridge Gas recommends a recurring three stage approach:

---

[1] https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/255ea3546df802b585257e38005460f9/$FILE/CE-05-EMV%20Guidance%20Final%20%2011-1-2016.pdf
[2] https://www.ieso.ca/-/media/Files/IESO/Document-Library/EMV/Evaluation-Measurement-and-Verification-Protocol-V4.ashx
[3] https://www7.eere.energy.gov/seeaction/sites/default/files/pdfs/emv_ee_program_impact_guide_1.pdf
[4] http://www.apscservices.info/EEInfo/TRM6-1.pdf
[5] https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/EE_and_Energy_Savings_Assist/CAEnergyEfficiencyEvaluationProtocols.doc

i. *Identify and select* evaluation topics that would provide the most benefit from evaluation methodology improvements, either topics that are not currently addressed in the Ontario DSM evaluation protocols, or existing topics that require refinements. The selected topics should be agreed upon by OEB Staff, Enbridge Gas, and the EAC.
ii. *Define and action* the steps required to assess the selected evaluation topics. This would include developing a scope of work and project plan to address the topic and may include additional research and/or the involvement of third-party expert consultants. The deliverable would result in an update to the Ontario DSM evaluation protocols.
iii. *Publish* the updated version of Ontario DSM evaluation protocols

7. Examples of topics that can be addressed within evaluation protocols include, but are not limited to, cost effectiveness methodology and net-to-gross evaluation methodology.

8. Cost-effectiveness assessments are a critical input to DSM policy discussions and decisions. As part of the 2015-2020 DSM Framework, the OEB provided guidelines for cost-effectiveness assessments, and as part of this DSM Plan Application, Enbridge Gas has reiterated and updated those guidelines where necessary. While this topic is not necessarily onerous, including it in Ontario DSM evaluation protocols ensures that OEB Staff, Enbridge Gas, and stakeholders are provided sufficient opportunity to contribute and improve the guidelines. This provides all parties the assurance that the approach to cost-effectiveness continues to be appropriate, and that a process exists to continuously review and improve the methodology as needed.

Modernization of Net-to-Gross Evaluation Methodology

9. Net-to-gross adjustments (which include free-ridership and spillover adjustments) reflect the savings specifically influenced by energy conservation programs. In general terms, net-to-gross mitigation refers to the way in which a DSM program's design and delivery is executed to minimize participation from customers who would have completed the efficiency upgrade without the DSM program. Enbridge Gas is taking steps to mitigate NTG through the design and delivery of its programming.

10. Separate from net-to-gross mitigation efforts, net-to-gross evaluation methodology refers to the way in which net-to-gross adjustments are determined. The net-to-gross evaluation methodology is critical to understanding how successful a program's design and delivery methods are at influencing customers to participate in the program. Historically, net-to-gross adjustments have been determined for natural gas utilities in Ontario via self-reported studies, where a sample of past program participants are asked whether their participation was attributable to the program. However, energy conservation program experts across North America have identified fundamental concerns with the effectiveness of measuring net-to-gross adjustments using the self-reported methodology. Research Into Action Inc., with input from expert Dr. Jane Peters, set out these concerns in its August 2017 report to Enbridge Gas (Attachment 1). In Section 3 of the report, Research Into Action Inc. states that the self-reported methodology can lead to inaccurate net-to-gross adjustments, due to the following:

- Difficulty for participants to accurately attribute energy conservation decisions between themselves and the energy conservation program.
- Difficulty for participants to identify the hypothetical alternative (i.e. what energy conservation decisions would they have made absent the energy conservation program).
- Tendency for participants to rationalize past decisions in ways that are consistent with their current attitude, as opposed to their prior attitude. For example, if a

participant has become more energy-conscious due to the energy conservation program's influence, when asked to self-report the programs' influence on past decisions, they are more likely to consider their current attitude towards energy conservation, as opposed to their attitude at the time of the decision.

- Tendency for participants to provide socially desirable responses. For example, if the participant believes it is socially desirable to be energy-conscious, they may respond to a self-reported survey in a way that indicates they would have done the "right" thing themselves – even if it was in fact the energy conservation program that influenced their behaviour.
- Difficulty for participants to recognize all elements of the energy conservation program's influence. For example, the participant may not be aware of the utility's program efforts towards contractors or equipment vendors, which may have influenced their behaviour.

11. In an effort to better understand other net-to-gross evaluation methodologies utilized in other jurisdictions, in 2020 Enbridge Gas retained SeeLine Group to conduct a jurisdictional scan (Attachment 2). As noted in the Executive Summary, the scan found that, while the self-report methodology continues to be common, there are at least five net-to-gross evaluation methodologies currently being used across North America:
    - Self-report
    - Expert/Delphi Panel
    - Market effects (as proxy value or for consideration)
    - Randomized Control Trials & Quasi-Experimental Studies
    - Econometric modeling

12. One of the methodologies that appears to be gaining traction in other jurisdictions (Illinois, Massachusetts, and Michigan) is the Expert/Delphi Panel methodology. This

methodology consists of a more intelligent approach to determining net-to-gross adjustments. Rather than simply accepting the outcomes of a self-report study (which has its limitations noted above), the Expert/Delphi Panel consists of a group of DSM experts who can use the self-report study as an input into the determination of net-to-gross adjustments, along with other information and inputs (including market data and program design/delivery approaches).

13. In Michigan specifically, the Delphi Panel is provided with all appropriate inputs, and each expert provides their recommendation for a net-to-gross adjustment with supporting rationale, (Attachment 2, page 8). The evaluator then "reviews the input from all panel members, distills the information, and shares a recommended NTG value to the Panel with the basis for the recommendation. There is an opportunity for the panel to provide feedback if there is a disagreement", (Attachment 2, page 10).

14. While Enbridge Gas is not necessarily requesting an Expert/Delphi Panel be implemented, Enbridge Gas is concerned that without Ontario DSM evaluation protocols, the net-to-gross evaluation methodology in Ontario will remain unchanged and potentially sub-optimal, when other well-considered methodologies may be available. To ensure the OEB is reasonably reassessing the net-to-gross evaluation methodology used in Ontario, it is imperative that a process to develop and maintain Ontario DSM evaluation protocols is initiated.

<u>Evaluation Contractor Recommendations Status</u>

15. In its DSM Letter, the OEB stated the following:

> Additionally, as part of its application for a new multi-year DSM plan, Enbridge Gas is expected to provide information on how it has refined its processes and improved its tracking databases, as recommended by the OEB's Evaluation Contractor, to support the OEB's evaluation process, reduce costs and increase efficiencies.[6]

[6] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

16. The following sets out Enbridge Gas's response to this. Within EGD and Union Gas' 2015-2020 DSM Plans, the utilities requested funding for improved DSM tracking and reporting systems. The OEB approved the request in its January 20th, 2016 Decision on the utilities' plans. For the Union rate zones, the system was rolled out during the 2018 program year, and for the EGD rate zone during the 2019 program year. The systems have resulted in improved in-year tracking processes, and a more streamlined delivery of data to the OEB's Evaluation Contractor ("EC").

17. As part of the annual DSM audit process, the EC provides a list of findings and recommendations to support continuous improvement of Enbridge Gas's DSM programs and the audit process itself. As part of the most recently completed audit, the EC provided two findings and recommendations related to tracking databases within its 2019 Natural Gas Demand Side Management Annual Verification Report.[7] Enbridge Gas's responses to all the findings and recommendations are also included the EC's report.

18. The first finding and recommendation (O1) referred to a request by the EC that Enbridge Gas "include a unique site-level or customer-level identifier for every measure installed in the program to allow the evaluator to identify all projects installed at a single customer, regardless of program or program year."[8] Within Enbridge Gas's response, the utility confirmed that the Union rate zones tracking information provided to the EC currently provides this information. Enbridge Gas also confirmed that, starting with the 2020 verification cycle, Enbridge Gas will include the information for the EGD rate zone.

---

[7] Ontario Gas DSM Evaluation Contractor, 2019 Natural Gas Demand-Side Management Annual Verification Report, DNV.GL (December 3, 2020), pp. 33-34. https://www.oeb.ca/sites/default/files/2019-Natural-Gas-Demand-Side-Management-Annual-Verification-Report.pdf
[8] Ibid.

19. The second finding and recommendation (O2) referred to a request by the EC that electronic components be developed for the Technical Resource Manual ("TRM"), to reduce burden on utility staff, reduce evaluation costs, and limit errors on the tracking data. Within Enbridge Gas's response, Enbridge Gas confirmed that the OEB has primary ownership of the TRM including the development of an electronic component. OEB Staff also provided a response, agreeing that an electronic component could be beneficial and that it would consider options on how to implement the finding and recommendation during the 2021 year.

20. Furthermore, starting with the 2019 program year, Enbridge Gas aligned where possible the format and structure of the tracking database files provided to the EC, between the Union rate zones and the EGD rate zone. This included providing data to the EC in a single flat file, which the EC had previously indicated would be beneficial.

Process Evaluation Plan

21. In alignment with the OEB DSM Letter, indicating the expectation that "all future process evaluations undertaken by Enbridge Gas will be included in the OEB's EM&V Plan."[9] Enbridge Gas submits that following the OEB's Decision on the DSM Plan, the Company will develop a formalized Process Evaluation Plan ("PE Plan") and submit to the EC and EAC for inclusion in the EC's EM&V Plan.

22. This PE Plan will include a list of the offerings proposed for review including the recommended scope and expected deliverables for each. 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

[9] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 5.

EC concerning final scopes of work and deliverables prior to securing a third party delivery agent and executing each evaluation.

Review and Analysis of Net-to-Gross Assessment Issues for Natural Gas Demand Side Management Custom C&I Programs

August 25, 2017

Prepared by

research into action inc

3934 NE Martin Luther King Jr. Blvd., Suite 300 | Portland, Oregon 97212
www.researchintoaction.com

Review and Analysis of Net-to-Gross Assessment Issues for Natural Gas Demand Side Management Custom C&I Programs

August 25, 2017

Funded By:

Enbridge Gas Distribution, Inc.

Prepared By:

Research Into Action, Inc.

Ryan Bliss
Mersiha McClaren
Nathaniel Albers
Jen Loomis
Elizabeth Focella
Jane Peters

research into action inc

www.researchintoaction.com

PO Box 12312
Portland, OR 97212

3934 NE Martin Luther King Jr. Blvd., Suite 300
Portland, OR 97212

Phone: 503.287.9136
Fax: 503.281.7375

Contact:
Jane S. Peters, President
Jane.Peters@researchintoaction.com

Table of Contents

Executive Summary

As part of its mission to regulate Ontario's natural gas sector, the Ontario Energy Board (OEB) has developed guidelines specifying adjustments the natural gas utilities should make to gross energy and demand savings to estimate how much savings actually resulted from the programs' activities (that is, *net* savings). These adjustments include reducing savings accomplished through the program that would have occurred without program involvement (free-ridership) and adding savings caused by the program but without program participation (spillover). OEB also has produced guidelines on the allocation of savings to parties other than the program that may have influenced the energy-saving activities.

This report presents a review and analysis of literature relating to the adjustments described above, particularly as they relate to the natural gas utilities' custom C&I programs. This review and analysis demonstrates that many potential problems exist with the way that net savings assessment has been conducted. Particularly problematic are self-report methods, which are very common for their low cost and ease of administration. Such methods, however, can easily result in over-estimation of free-ridership for multiple reasons: respondent self-selection bias; a tendency to provide a "socially desirable" response to questions about what would have occurred absent the program; the tendency to rationalize past decisions as arising from internal motives; difficulty envisioning hypothetical alternatives; lack of awareness of all the factors that may have influenced an action.

Apart from the above issues – which limit the ability of a program participant to provide an accurate description of what would have occurred absent the program's influence – there are multiple methodological challenges to assessing net savings. A lack of statistical precision can produce estimates that may change notably from year to year. Spillover often is not included in net savings research and, when it is, it may very likely be under-estimated. Although OEB guidelines indicate that spillover should be accounted for in estimating net savings, OEB currently does not approve a spillover adjustment to the natural gas utilities' gross savings from custom commercial and industrial (C&I) programs.

Several policy considerations relate to how net savings are defined and assessed. For one, applying variable and unpredictable net savings adjustments retroactively can lead to conflict and litigation from dissatisfied shareholders (Kushler, Nowak, and Witte 2014). While it might be bad policy to settle for a clearly inaccurate net savings assessment to avoid such conflicts, it would be reasonable policy to search for an approach that is defensible and avoids conflict.

Another policy issue is whether the value of conducting net savings research on a regular basis justifies the cost. Some evaluators (e.g., Violette et al. 2015) have concluded that it may not, even when the research is conducted with relatively inexpensive self-report methods.

At least partly as a result of one or more of the above issues, recent years have seen strong trends toward estimating net savings by applying a negotiated (also called "deemed" or "stipulated") net-to-gross (NTG) ratio to gross savings (Kushler, Nowak, and Witte 2012, 2014; SBW, Research Into Action, Inc., New Horizon Technologies, Inc., and Ridge & Associates. 2013).

A final policy issue this report relates to is OEB's requirement to establish a method to allocate some energy savings from program-funded projects to other parties that might have influenced those projects (Ontario Energy Board 2014, pp. 21-22). Our reading of the requirement is that such savings should be allocated out of the program's *net* savings – that is, after adjusting for free-ridership and spillover. We argue that such an approach is inconsistent with the definition of free-ridership, which should include the influence of such other parties. If the allocation is done after the application of free-ridership and spillover adjustments, then the utility is penalized twice for the effects of the same external influences.

Based on our review and analysis, we offer the following recommendations to OEB and the natural gas utilities:

- **Develop a negotiated (also called "deemed" and "stipulated") NTG value.** This value should be based on a range of inputs, including a review of researched NTG values from similar programs in comparable jurisdictions that account for free-ridership and spillover, at a minimum, but also market effects if possible. Assessment of applicable NTG values from multiple studies should not treat all inputs equally but should follow a meta-analytic approach, which includes reviewing the study quality, assessing study heterogeneity, and developing a pooled estimate of variability based on the variabilities reported in the studies. The pooled estimate is a better representation of what the true estimate is in the population and it can provide insight into variability around NTG that are important to consider when determining what the value should be. Part of reviewing study quality should include assessing efforts taken to reduce the self-report biases identified in section 3. Other inputs to the negotiated NTG value should include structured expert judgment and any available market data or macroeconomic analyses. In developing the negotiated value, it may be valuable to employ a "value of information" approach, such as described by Violette et al. (2015).
- **Allocate any savings to parties other than the program only from the free-ridership portion of gross savings.** By definition, free-ridership represents the program-claimed savings that would have occurred without program assistance, which must include savings attributable to other parties. Allocating savings net of free-ridership to other parties doubly penalizes the program.

As noted in the body of this report, establishing a negotiated NTG value does not preclude doing NTG research, as such research may be valuable for program planning and implementation as well as to inform periodic adjustments to the negotiated NTG value. We recommend that OEB and the natural gas utilities observe the following when NTG research is conducted:

- **Always include spillover and, if feasible, market effects assessments.** As documented in the body of this report, failure to account for these factors will underestimate NTG.
- **If using self-report, employ methods to reduce the bias toward high free-ridership.** Energy Trust of Oregon, with input from Research Into Action, Inc., developed an approach to free-ridership assessment that attempts to control for the high-free-ridership bias of other self-report methods in addition to reducing customer fatigue (see Bliss, McClaren, Folks, and Kociolek, 2015; Roy and Bliss 2012). This alternative approach balances the counterfactual assessment with a component that assesses the influence of the various program interventions, which typically produces a lower free-ridership estimate than the counterfactual (PWP and Evergreen Economics 2017).
- **Assess free-ridership as close as possible to project implementation.** The longer the time that has elapsed between the implementation of the project and the assessment of the decision-making that went into the project, the less salient the external influences (including the program

influence) will be to the program participant and the more likely that participant will be affected by the biases toward free-ridership responses.

- **Use multiple methods and triangulate the NTG estimate.** The use of multiple methods, such as surveys of contractors as well as program participants, is now generally regarded as best practice among energy efficiency experts (Kushler et al. 2014; PWP and Evergreen Economics 2017).

Following the above recommendations may allow the natural gas utilities to continue offering large C&I customers in Ontario opportunities to generate high energy savings through custom programs that may not otherwise be achievable.

1. Introduction

The Ontario Energy Board (OEB) regulates Ontario's natural gas sector. As part of its mission, OEB has specified that the natural gas utilities should adjust gross energy and demand savings totals by free-ridership (energy savings accomplished through the program that would have occurred without program involvement) and spillover (energy savings caused by the program but occurring without program participation). OEB also has produced guidelines relating to the allocation of savings to parties other than the program that may have influenced the energy-saving activities. The purpose of these adjustments is to estimate programs' *net savings*, or the savings that actually resulted from the programs' activities.

Currently, OEB approves adjustments to the natural gas utilities' gross savings from custom commercial and industrial (C&I) programs based on researched free-ridership but not spillover.[1] This report presents a review and analysis of literature relating to net savings estimation to shed light on OEB's guidelines and requirements as they relate to the natural gas utilities' custom C&I programs. The report argues that estimating net savings through annual research is problematic for multiple reasons and argues instead for establishing a negotiated (also called deemed or stipulated) net savings approach for custom C&I programs.

1.1. Background

The Ontario Energy Board (OEB) regulates Ontario's natural gas sector. As part of its mission under the Framework for natural gas demand side management (DSM; see OEB 2014a), OEB developed filing guidelines for natural gas DSM programs (OEB 2014b). Among other things, these guidelines identify adjustment factors to be applied to the gross energy and demand savings totals reported by DSM programs to "ensure that the energy savings that are the result of DSM programs truly reflect those which the gas utilities directly influenced" (p. 20). Those adjustment factors include free-ridership and spillover. They also include attribution, which the OEB explains as relating "to whether the effects observed after the implementation of a natural gas utility's DSM activity can be attributed to that activity, or at least partly results from the activities of others" (p. 21).

In May 2015, the natural gas utilities contracted with DNV KEMA (now DNV GL) to carry out a study of free-ridership for their custom commercial and industrial (C&I) programs (Ontario Energy Board 2015a).[2] However, this research, now under OEB management, addresses free-ridership only, and not spillover (Ontario Energy Board 2015b). As of the preparation of this report, the results of the DNV GL evaluation have not been made public.

1 In fact, the Evaluation, Measurement, and Verification (EM&V) plan (DNV GL 2016) included a plan to conduct spillover research, but OEB determined there would not be sufficient time to complete the spillover research (Marc Hull-Jacquin, Enbridge Gas Distribution, personal communication). Note that the plan was to collect spillover data only through a participant survey. As argued in section 4.2.2 of this report, such an approach likely would underestimate spillover.

2 This study was undertaken with the endorsement of the Ontario Natural Gas Technical Evaluation Committee (TEC). In August of 2015, OEB announced a plan to transition the TEC's evaluation activities to OEB under the new DSM evaluation governance structure.

1.2. Purpose and Organization of This Report

The purpose of this report is to review and analyze literature on net savings estimation as it relates to OEB's guidelines and requirements and offer a recommendation on an appropriate method to be applied going forward. Section 2 of the report briefly summarizes the various approaches to assessing net savings (the savings that resulted from program activities) and developing a NTG ratio – the ratio of a *net savings* to *gross savings*, or the total savings that occurred through program-funded energy efficiency activities. The remainder of the report then presents information from a wide range of sources that brings into question whether OEB's selected approach accurately assesses the savings that resulted from the natural gas utilities' custom C&I programs' activities.

Section 3 focuses on the challenges inherent in the use of customer self-report survey data to assess free-ridership. This is the most common free-ridership assessment approach because of its low cost, and it is the approach that was used to estimate free-ridership and NTG for the Ontario natural gas utilities' custom C&I programs. Such challenges include several well-researched and -documented psychological tendencies as well as research design and implementation practices that would tend to exaggerate free-ridership values. This section argues that such challenges may particularly affect assessment of free-ridership in custom programs.

Section **Error! Reference source not found.** presents information on why – apart from the above challenges to the self-report methodology – researched NTG values likely are not accurate in any given year. Section 5 then discusses the policy issues related to the identified research limitations. These include the weighing of the cost of NTG research against the value of that research and the conflicts that may arise when researched NTG is retroactively applied to a program's gross savings. Section 5 also discusses how the logic behind NTG assessment relates to OEB's requirements regarding the attribution of energy and demand savings to parties other than the program.

Following the above sections, we present a brief conclusion and our recommendations to OEB and the natural gas utilities.

2. Review of Net Savings Assessment Methods

Evaluators are often required to calculate a program's net savings by applying net-to-gross (NTG) adjustments to the gross savings. Evaluators use a variety of methods to estimate NTG (Violette and Rathbun 2014), but our review of the literature reveals that the industry largely recognizes free-ridership and spillover to be the primary components of NTG estimation.[3]

Free-ridership (free-ridership, FR) refers to the portion of energy savings that participants would have achieved in the absence of the program through their own initiatives and expenditures (Violette and Rathbun 2014). Free-ridership ranges from 0 to 1, with 0 being no free-ridership (or, total program attribution) and 1 being total free-ridership (or, no program attribution). The values in between represent varying degrees of partial free-ridership. Spillover (SO) refers to the program-induced adoption of measures or actions by non-participants and participants who did not receive financial incentives or technical assistance from the program (Violette and Rathbun 2014). Spillover ranges from 0 to infinity, with 0 being no spillover and values greater than 0 demonstrating the existence and magnitude of spillover. Evaluation teams use the following formula to calculate a NTG ratio when relying solely on these components:

$$NTG = 1 - FR + SO$$

The following sections review some of the more common methods for estimating NTG.

2.1. Self-Report Surveys

Self-report survey is the most commonly used method for estimating NTG for those programs that target consumers directly and for which it is not possible to randomly assign consumers into a control and experimental groups. Our review of the literature reveals considerable variation in how evaluators and jurisdictions estimate NTG via self-report surveys – both in the questions asked and the algorithms used to estimate free-ridership and spillover. In the following sections, we report some basic tenants of the self-report survey method.

2.1.1. Free-ridership Estimation

Evaluators typically survey program participants to estimate free-ridership, but some evaluators conduct surveys with market actors (such as program-affiliated contractors) to inform free-ridership estimates (Violette and Rathbun 2014). To estimate free-ridership, evaluators typically ask survey respondents about what would have happened in absence of the program (the "counterfactual") and/or how much influence the program had on the upgrade decision (Violette and Rathbun 2014). Evaluators may ask

[3] Although some jurisdictions incorporate leakage and market effects when considering net impacts (Messenger et al. 2010), these components are rarely estimated. Market effects are changes in the adoption of energy-efficient products, services, or behaviors due to program or policy interventions. Leakage refers to indirect or unintended program effects. For example, if a program provides a discount for an LED at retail stores to increase LED adoption in the residential sector, some of those discounted bulbs could "leak" (be installed) in the nonresidential buildings because contractors are buying them.

participants to assess the counterfactual or program influence regarding their upgrade project as a whole or may ask participants about each specific measure or groupings of measures. Specific question and scoring design varies considerably in the industry. However, the industry is unanimous in the theoretical minimum of 0, or 0% free-ridership, and a maximum of 1, or 100% free-ridership.

The measure- or program-level free-ridership value typically is calculated as the mean of the sample values from the self-report research, often weighted by the total savings of the sampled projects.

2.1.2. Spillover

Evaluators often use self-report surveys to estimate both participant and non-participant spillover. Participant spillover refers to program-attributed savings from additional non-incented measures installed by participants who were influenced to do so by their experience participating in the program. Non-participant spillover refers to program-attributed savings from measures installed by non-participants who were influenced to do so by either directly or indirectly by the program.

Evaluators may survey program participants and non-participants to estimate spillover or may survey market actors (such as program-affiliated contractors) to inform spillover estimates. Evaluators use a variety of survey techniques to gather information on the measures installed outside of the program and the relative program influence on said measures. Evaluators may use primary or secondary research to estimate savings values for measures installed outside of the program.

Not all energy savings from measures installed without program incentives count as spillover. A common approach is to determine the amount of savings to attribute to the program based on the level of program influence on the decision to install the measures, as assessed from the surveys with participants, non-participants, or market actors. One approach is to establish a threshold level of influence and count all the savings from an installed measure if the rated program influence exceeds that threshold. Another is to attribute a portion of the savings for a given measure based on the rated influence. For example, a rated program influence of “3” on a 1-to-5 influence scale (from “no influence” to “great influence,” say) might result in attribution of 50% of the savings to the program, while a rated program influence of “1” might result in 0% attribution and “5” might result in 100% attribution.

While self-report approaches to free-ridership yield a free-ridership percentage for each respondent, self-report spillover research typically yields a total spillover energy (or demand) savings value for each respondent. The measure-, project-, or program-level spillover percentage is calculated as the total spillover savings divided by the total measure, project, or program savings.

2.2. Experimental Approaches and Billing Analyses

Randomized control trials (RCT) or quasi- experimental methods (QEM) rely on billing data for estimating net savings. The distinction between the two is that RCT allows random assignment of customers to treatment and control groups while QEM may use a control group that is not randomly selected or, in some cases, does not even use a control group. Both methods typically use before-and-after-program billing data from the treatment and control groups to assess program effects, often attempting to control for other factors, such as weather. Both methods generally require large samples and selection of an appropriate control group and can be costly to carry out. Incomplete billing data can contribute to the challenge of conducting this type of analysis.

An RCT approach, which is recommended by the State and Local Energy Efficiency Action Network for behavior based programs (SEE Action 2012), will produce an estimate of net energy savings that is internally valid and unbiased, but it is not always feasible to implement (e.g., one cannot randomly assign subjects to naturally occurring groups). Naturally occurring groups occur when the program is an open-enrollment or opt-in program. Most custom C&I programs are opt-in programs.

The key challenge of opt-in program is self-selection bias. Self-selection bias refers to pre-existing differences (e.g., building square footage) between those in the experimental and control groups. The selection bias can be minimized through the use of statistical methods for sampling such as “regression discontinuity”[4] or “matched controlled group”[5] (SEE Action 2012 and Hall et al. 2004). However, the heterogeneity of large C&I custom participants makes matching a challenge. Moreover, unless Advanced Metering Infrastructure (AMI) is in place, billing data are not likely to be sufficiently granular to see the effect.

2.3. Market Sales Data Analysis

Sales data analysis is another method for estimating free-ridership and various components of spillover. The most common approach involves cross-sectional comparisons of sales of energy-efficient products or services in the area served and not served by the program. For example, efficient water heater sales in Ontario could be compared with efficient water heater sales in other areas of Canada, including regions with and without water heating programs. Water heater purchases in a specific time period serves as the dependent variable in a regression-based model. Independent variables in the model can include elements of program support, water heater technology saturation at the beginning of the time period, the length of prior program support in the area, and household-level measures of demographic, economic, or social characteristics.

The primary challenge is the selection of an appropriate comparison area and the availability of market sales data. The regression does reduce the need for a perfect comparison area as demographic and social characteristics can be adjusted for. Nevertheless, this method suffers from omitted variable bias – that is, the regression will likely not be able to account for all influencing factors.

2.4. Top-Down or Macroeconomic Modelling

Evaluators can rely on top down or macroeconomic models of sector-level state, regional, or national data on programs and target markets to estimate net impacts. Such models are based on changes in aggregate energy consumption (rather than changes in consumption for a specific account, as analyzed in billing analyses) as a function of energy efficiency efforts. Such analyses require a standardized measure of energy efficiency “effort” (e.g., program expenditures) as well as sophisticated modeling to identify the impact of a given program year’s efforts over several succeeding years.

---

4 The regression discontinuity method selects a group of households just below the energy usage cutoff level as the control group and a group of households just above the energy usage cutoff level as the treatment group.

5 The matched control group method selects a control group with demographic and usage characteristics similar to those of the treatment group. The Regional Technical Forum (2010) recommends that, at a minimum, home type, location, and total baseline consumption characteristics of the control group should be similar to those of the treatment or experimental group.

2.5. Structured Expert Judgment

Some jurisdictions rely on a panel of experts to provide information used to calculate NTG. In these jurisdictions, a panel of experts knowledgeable about specific technologies and markets are asked to estimate baseline market share or to forecast market share, assuming common facts about the program, technologies, and other factors. In the Pacific Northwest, the Regional Technical Forum (RTF) helps utilities determine deemed savings values that take into the account baseline conditions, which includes free-ridership and spillover. The RTF uses an advisory committee, composed of regional experts, and subcontractors to regularly develop, update, and review a list of energy efficiency measures and determine appropriate deemed savings values based on engineering and market research.

2.6. Negotiated or Deemed Values

Deemed, stipulated, or negotiated values are NTG ratios that the program or commission determines are applicable and reasonable to apply to a program or portfolio. The NTG value deemed acceptable by the commission may come from a variety of sources, including:

- Literature review of other NTG studies from similar jurisdictions
- Structured expert judgement
- Market sales data analyses
- Top-down or macroeconomic models of data on programs and target markets
- Engineering estimates

Typically deemed values are adopted for consumer-facing or downstream programs. They typically are employed to save money and time compared to conducting monthly or annual research to determine NTG values, but they may also be used to avoid arguments concerning the calculation and award of utility shareholder incentives that may occur when researched NTG estimates are applied retroactively to gross savings estimates (Kushler, Nowak, and Witte 2014). We discuss these motives for using negotiated values in more detail in section 5.2.

Many jurisdictions rely, at least partially, on deemed values. To arrive at the deemed values, jurisdictions may use evaluations of programs and measures that include assessments of free-ridership and spillover. These evaluations may use some combination of the aforementioned methods to determine NTG and then, rather than conducting NTG research monthly or annually, rely on the deemed NTG values for a longer period of time. The jurisdictions revisit the deemed NTG values on some predetermined research schedule or when some element of the program changes or the market appears to be shifting somehow. To save money and resources, about 70% of all states apply deemed values determined from other jurisdictions' research (Kushler, Nowak, and Witte 2012).

One potential tradeoff of using the deemed approach is the lack of insight deemed values give program planners about how the market may be changing over time. In many cases, jurisdictions will allow the application of the researched NTG values for some programs or measures and apply deemed values to other programs where they are less concerned about insights into the market. As discussed in greater detail in section 5.3, some jurisdictions use deemed NTG values (or base compliance on gross savings, which is logically equivalent to having a deemed NTG value of 1.0) but also require NTG research to inform program planning.

3. Disadvantages of Self-Report Method

As noted in the previous section, self-report is the most common method for NTG estimation for downstream incentive programs, including C&I custom programs. It is the primary approach used to assess NTG among such programs in Ontario. The limitations of self-report to assess free-ridership, and consequently, NTG, are numerous, and several have received considerable attention in the literature (Peters and McCrae 2008; Ridge et al. 2009). It is important to note that the limitations of self-report are problematic not just for estimating free-ridership but for survey research more generally. The limitations may be organized into three broad categories: factors limiting the ability to respond accurately, research design and implementation issues, and factors specific to custom programs that would tend to exacerbate the effect of the other limitations.

3.1. Factors Limiting the Accuracy of Responses

Psychological research provides numerous reasons for why the responses people provide on self-report measures should be interpreted with caution. Below, we describe several pertinent and well-researched theories that highlight the potential for inaccurate self-reporting. While these tendencies and biases are found to reduce the accuracy of responses, it is important to note that they do not suggest that respondents are entirely unable to notice the program's influence, nor do they mean that there are no respondents who are not completely clear-eyed about their own motives and external influences. Rather, the research suggests a tendency to obscure respondents' judgment in the aggregate, with a resulting impact on the evaluation of program attribution.

3.1.1. Difficulty Estimating and Reporting Attribution

To assess free-ridership, respondents may be asked whether they, or the organization they represent, would have engaged in the energy efficiency behavior had the program not been in place. They may also be asked to account for what specifically caused them to decide on this energy efficiency action. In other words, respondents are tasked with determining the correct attribution for their behavior – who gets credit for the actions they took. Decades of research have documented that the attributions we make for our and others' behavior are often incorrect or at the very least, do not recognize the range of factors that lead to a given behavior.

Research suggests that a variety of motivations – the desire to maintain consistency between attitudes and behavior, to see oneself in a positive light, or to present oneself in a positive light to others – might all contribute to inaccurate or limited accounts for behavior (Kunda 1987). This means that when respondents (those that have opted for the energy efficiency behavior) are asked about the reasons for their behavior, their motivations will likely bias how they respond.

For example, the motivation to maintain consistency between attitudes and behavior suggests that respondents might infer that since they engaged in the energy efficiency behavior, they must in fact have favorable attitudes toward energy efficiency. This would bias them to reason that, since they have positive attitudes toward energy efficiency, they would likely have engaged in this behavior regardless of the program. This would overestimate free-ridership.

Relatedly, people tend to take credit for their successes and explain away their failures (Miller and Ross 1975). This self-serving bias suggests that if the energy efficiency behavior elicited positive outcomes for the respondent, they would be even more likely to believe that the success rests on their decision as opposed to something external to themselves. Thus, they would attribute the decision to themselves and subsequently believe that they would have engaged in the behavior even if the program did not exist. Ultimately, this would overestimate free-ridership. Additionally, when interviewed by an evaluator of an energy efficiency program, respondents might be nudged to attribute their behavior to their, socially desirable energy efficiency-positive attitudes, a tendency which we describe next.

3.1.2. Difficulty Reporting the Hypothetical Alternative (Counterfactual)

When respondents are asked whether they would have engaged in the energy efficiency behavior without the program, they are being tasked to imagine an alternative reality. Without having been in that situation, they are asked to imagine what they would have done if the program in question, that was designed to promote energy efficiency, never existed. This is asking the respondent to imagine the hypothetical with the hope that their speculation leads to an accurate assessment of their assumed behavior. Not only do they need to imagine a fictitious scenario, they then must imagine what their behavior would have been. To construct this alternative reality, respondents need to speculate, drawing from any information that may be available to them. This act of imagining would be influenced by numerous factors including what is salient to them at the time of the interview (energy efficiency is likely at the top of their mind), as well as the biases (attribution bias, the tendency to rationalize past decisions) we discussed in this section -- all of which should lead the participant to say they would have done the energy efficiency behavior regardless of the program and, consequently, lead to an overestimate of free-ridership.

While solutions are provided including by Ridge et al. (2009) and Violette and Rathbun (2014), the proposed solutions may simply increase the chances of arbitrariness in the free-rider score calculation, a topic which we will discuss in more depth later in this section.

3.1.3. Tendency to Rationalize Past Decisions

Because people prefer consistency, when they are made aware that their actions do not align with their attitudes, they experience a basic feeling of discomfort known as cognitive dissonance (Festinger 1957; see also Stone et al. 1997). Notably, this desire for people to make their behavior consistent with their attitudes has been applied to encouraging environmental sustainability (Dickerson et al. 1992). Pertinent to our discussion, when a person is asked to imagine whether they would have engaged in the energy efficiency behavior had the program not existed, they may be faced with a conundrum. Given that they have already, publicly, done the energy efficiency action, if they express an attitude inconsistent with their behavior, their attitudes would be out of step with their behavior, and subsequently cause them discomfort. The easiest route to reduce the dissonance should be to bring one's attitudes in line with their energy efficiency behavior. Thus, this would cause the person to change their attitudes to be more positive to energy efficiency, which would make it more difficult to imagine a world in which they would not have engaged in that behavior to begin with. Essentially, the avoidance, or attempt to resolve, dissonance should bias the respondent to say they would have engaged in the behavior regardless of the program (Peters and McCrae 2008).

3.1.4. Tendency to Provide Social Desirable Responses

Another potential limitation to self-report methods is the tendency for respondents to provide answers that are socially desirable (termed the "social desirability bias"). For example, to assess free-ridership, a respondent who indicates they have performed the energy efficiency behavior would then be asked (through either a single question or a series of pointed questions) whether they would have engaged in the energy efficiency behavior if the program did not exist. A responded who says "yes, I would have done the same energy efficiency behavior without the program" would be considered a free-rider. Psychological literature presents multiple reasons for why the response should be interpreted with caution, at the least. For one, the response to the question could simply be due to the possibility that the respondent wants to provide the socially appropriate answer, which would be that the energy efficiency behavior is the "right" thing to do, thus, it would be adopted by the respondent even if the program never existed.

Researchers and evaluators have proposed several solutions to address the likely possibility that respondents will be biased toward providing the socially desirable, though potentially untrue, response (see Ridge et al. 2009; Keating 2009). One of these solutions is to use a questionnaire where the "right" or socially appropriate answer might not be so obvious to the respondent; the California method seeks to do this. Another way to mitigate the social desirability bias is to ask multiple questions that may converge on a true estimate of free-ridership. Ridge et al. (2009) identified research on various for minimizing bias, which they believe will mitigate potential problems. They further noted a potential countervailing bias to exaggerate the influence of the program to help ensure that the program incentives continue.

While incorporating the various techniques that Ridge et al. (2009) mentioned may help, doing so lengthens the questionnaire, which adds other concerns, including increasing respondent fatigue (and potentially loss of engagement), and increasing cost of administering the survey. It also may make calculating a final free-ridership estimate more arbitrary, which we discuss in more detail at the end of this section.

Further, while these solutions are elegantly defended and may mitigate some of the contribution of the social desirability bias on the estimate of free-ridership, even accounting for this phenomenon does not remove the impact of other psychological phenomena and biases on self-report. These other biases also suggest the limitations of self-report and argue for caution when using this methodology, especially to assess the presumed impact of intentions on behavior. Below, we describe each of these documented biases and psychological phenomena and how they obscure an accurate estimation of free-ridership.

3.1.5. Failure to Recognize All Direct and Indirect Pathways of Program Influence

It is conceivable that the individual respondent may be unaware of all direct and indirect pathways of program influence. Primarily, when accounting for their energy efficiency behavior and assessing whether they would have engaged in the energy efficiency behavior without the program incentives, they may fail to recognize all the pathways of program influence and erroneously conclude they would have engaged in the behavior even if the program has not existed. For example, while respondents may note the influence of contractors or equipment vendors (who may be salient to respondents since they may have interacted to set up the energy efficiency solution), they may not recognize the degree to which the program influenced those trade allies. Thus, they may not fully appreciate the degree to which the program indirectly influenced their adoption of the energy efficiency behavior (Bliss, Sage, and Diebel 2017). Respondent tendencies to neglect these indirect pathways of program influence on their decision to opt for energy efficiency would thus inflate the free-rider estimate.

3.1.6. Difficulty Isolating Program Influence from Longer-Term Market Transformation Effects

The decisions and behaviors of people and organizations are not solely influenced by an individual program, but by a variety of other forces. As described by Vine et al. (2010), numerous public policies and market interventions influencing energy efficiency often operate simultaneously, and it is likely impossible to extract the influence of a single program. This is an especially difficult task for a single respondent. For example, in addition to the specific program in question, public policy (e.g., state government messaging advocating for energy efficiency, tax credits for energy efficiency measures) as well as market interventions (e.g., media coverage of energy efficiency issues, other private-sector advertising) and other forces such as energy efficiency education in universities and other schools likely all exert their influence on the consumer's behavior. The individual respondent would conceivably have difficulty identifying the unique contribution of the program on their behavior apart from the other numerous influences, including market transformation effects.

3.2. Research Design and Implementation Issues

There are several issues relating to how surveys are designed and implemented that can affect accurate attributions of behavior, by exacerbating the psychological forces described above or by other means. Three such issues are response bias, survey timing, and arbitrariness in scoring free-ridership.

3.2.1. Survey Design and Response Bias

Good data are predicated on good survey design. The hurdles at this initial stage of research include response bias, more general issues related to sampling, and questionnaire construction. Most NTG research attempts to incorporate good instrument-design practices, such as avoiding double-barreled questions[6], making questions as clear as possible to respondents, and avoiding leading questions (e.g., "How satisfied are you with the program's generous incentives?"). NTG surveys may not be as likely to incorporate multiple-item scales, as advocated by Baumgartner (2013). Experienced NTG researchers also generally understand the importance of attempting to reach and interview a contact who (theoretically) can report knowledgeably on the decision to do the energy efficiency project in question.

One looming issue within the area of survey design, however, is response bias. Pertinent to our discussion, response bias may inflate free-ridership estimates. For example, in the case of a person or organization that participates in a program to encourage taking an energy efficiency action, to assess free-ridership we would want to know whether that organization or person would have taken the action

[6] Double-barreled questions that do not allow the respondent to differentiate separate things in the response. For example, asking the respondent to rate satisfaction "with the program and its incentive" does not allow the respondent to indicate satisfaction separately for the program and for the incentive.

if the program had not existed. It is possible that those adopters who have less positive attitudes toward energy efficiency might not have engaged in the energy efficiency behavior without program incentives (i.e., not a free-rider) but may also be less likely to want to take a survey about this behavior. Conversely, those with positive attitudes toward energy efficiency behavior may have indeed engaged in the energy efficiency behavior regardless of the program (making them a free-rider) but should also be more likely to take a survey about energy efficiency behavior. Thus, this response bias would overestimate the number of free-riders.

3.2.2. Timing of Surveys

Several researchers (Schwarz 2007; Keating 2009; Peters et al. 2010; Violette and Agapay-Read 2016) have noted that the timing of surveys is particularly important to ensure the most valid responses. The longer the time that has elapsed between the behavior and the self-report about the behavior, the more likely the respondent is to forget their intentions, the motivations, and other influences on their behavior (even if the respondent had been aware of them at the time of action). Returning to attribution theory, the respondent's difficulty in accurately attributing their energy efficiency behavior is increased the longer the time between the energy efficiency action and the survey because the less obvious influencers on the respondent's decision and action fade in their memory. Further, with a longer amount of time between the behavior and the self-report, the more likely the respondent is to be influenced by other psychological biases. For example, research on the mere-ownership effect (Beggan 1992) suggests that people value an object more once they own it. Once an object is theirs (as a gift or after purchase), people are more favorable than when it was not their possession. Hence, one may imagine that the respondent has begun to value the energy efficiency product simply by possessing it. When asked if they would have done the energy efficiency behavior without the program, their ownership of the product should bias their ability to imagine themselves without it, and to increase the value of the energy efficiency product. The more that time has passed, the more difficult it may be to imagine oneself without that now-valued object.

3.2.3. Potential Arbitrariness in Free-Ridership Scoring Methods

Finally, some (Violette and Rathbun 2014) have noted that there is considerable arbitrariness in scoring methods to create free-rider estimates. By using a lengthy survey, combining open-ended and close-ended questions, and interview methods that point out respondent's inconsistent answers, the interpretation of the data from these questionnaires becomes largely dependent on the interpretation of the evaluator. Granted, if evaluations are using the same calculation, they should reach the same estimation of free-ridership, making their estimations reliable. However, their relative agreement does not necessarily indicate accuracy. Their estimation, though agreed upon, may still be incorrect, and therefore invalid.

3.3. Challenges Particular to Custom Programs

Haeri and Khawaja (2012) argued that no traditional approach adequately accounts for either free-ridership or spillover, especially for commercial, industrial, and new construction programs. Particularly relevant to the discussion here, they argued that self-report is especially problematic for assessing free-ridership in C&I programs because of the complex decision making involved in those types of projects.

If Haeri and Khawaja (2012) are correct, the issues they cite may be particularly a concern for custom programs. Moreover, custom projects often are larger and have a longer planning horizon than prescriptive projects. The longer planning horizons complicate assessments of the degree to which programs influence project planning, which could exacerbate the psychological forces that would tend to exaggerate free-ridership.

This added complexity would naturally muddy respondents' ability to accurately identify attributions for their energy efficiency behavior. With multiple forces influencing their behavior, and at different times, it would be especially difficult for the individual respondent, who has a limited perspective, to determine whether the program had its intended effect or to identify the factors that truly did influence their behavior. Particularly, as previously discussed, respondents have difficulty isolating program influence from market effects as well as differentiating all the direct and indirect pathways of program influence. Adding increased complexity to this already less-than-transparent situation may especially impede respondent's ability to answer accurately. Importantly, obscuring respondents' ability to answer accurately would likely nudge them to rely on their biases; they are unsure and need to rely on something to guide their judgements.

A concrete example may help illustrate the above point. Large C&I programs often work with larger customers over a long period of time – sometimes, for a decade or more – to identify and catalog available energy efficiency projects. In such scenarios, it is possible that, when a particular project becomes prioritized for implementation, the customer's staff retain knowledge of the project as an option but have forgotten that it was the program staff who identified it in the first place.

As decades of decision making as well as social psychological literature document, complexity and ambiguity increases the likelihood that people will rely on their biases to make judgments (Frisch and Baron 1988). In this case, their biases (e.g., social desirability bias, self-serving bias) will nudge them to say they would have taken the energy efficiency route regardless of the program and therefore, lead to an overestimation of free-ridership.

3.4. Summary

The above discussion provides several reasons why self-report surveys probably do not provide accurate estimates of free-ridership. Much well-researched and validated psychological theory indicates that self-report research may overestimate free-ridership, and the complexities of decision-making in custom C&I projects may make self-report a particularly problematic way to assess free-ridership for such programs. Our review of the literature, in both psychological theory and that specific to energy efficiency Evaluation Measurement and Verification (EM&V), found little argument and no evidence that self-report assessment under-estimated free-ridership. The one possible exception, as noted above, is that surveyed participants may explicitly exaggerate the importance of the program to help ensure the continued availability of the incentives. While this possibility cannot be dismissed out of hand, it must be weighed against all the well-documented psychological tendencies that would bias self-report in the other direction. While attempts at varying levels of success have been implemented to mitigate the issues and biases that may influence free-ridership estimates, the theory and research cited above suggests that they are likely leading to bias in one direction. That is, psychological biases and issues related to survey design largely lead to over (and rarely under) estimation of free-ridership.

4. Other Methodological Concerns with Researched NTG

The previous section provided several reasons why self-report research may overestimate free-ridership and, hence, underestimate NTG. Those are important considerations, but they are not the only arguments for using a negotiated NTG value. The following subsections document two key issues with relying on researched NTG:

- Lack of statistical precision can mean that the researched NTG in a given year may not be accurate.
- Spillover is a potentially important part of NTG, but it often is not sufficiently accounted for in researched NTG.

4.1. Researched NTG Can Lack Precision

The components of NTG – free-ridership and spillover – can vary greatly from year to year and across programs. While both the use of different assessment methodologies and differences in program implementation can contribute to differences in estimated NTG, a lack of precision in the individual assessments also contributes to the differences. The issue of lack of precision is important and worth a brief discussion before we proceed to the reported NTG findings.

4.1.1. The Meaning of Statistical "Precision" and "Confidence"

In statistics, "precision," strictly speaking, refers to the range of values that repeated samples from a given population will produce. Every sample produces an estimate of some characteristic of the population it is drawn from but, obviously, no two samples will produce the same exact estimate of that characteristic. Thus, calculating free-ridership in two samples of custom projects from the same program in the same program year will produce two different estimates of free-ridership for the program. A sample has high precision if most repeated samples of the same size, and drawn using the same methods, would produce estimates within a small range of values.

But what do we mean by "most" repeated samples or a "small" range of values? The meaning of "small" refers to the stated precision level and the meaning of "most" relates to the desired level of "confidence." When evaluators talk about precision, it is always in the context of the confidence level. In evaluation, we often seek 10% precision at 90% confidence at the program level. That is, we want a sample such that, if we continued to draw additional independent samples, 90% of those samples would produce an estimate that is no more than 10% higher or lower than the estimate our sample produced. (This often is interpreted as meaning that such a sample gives us 90% confidence that the true population mean is within 10%, higher or lower, of the sample mean. While many statisticians believe this is not strictly speaking true, it is a useful way to think of the results.)

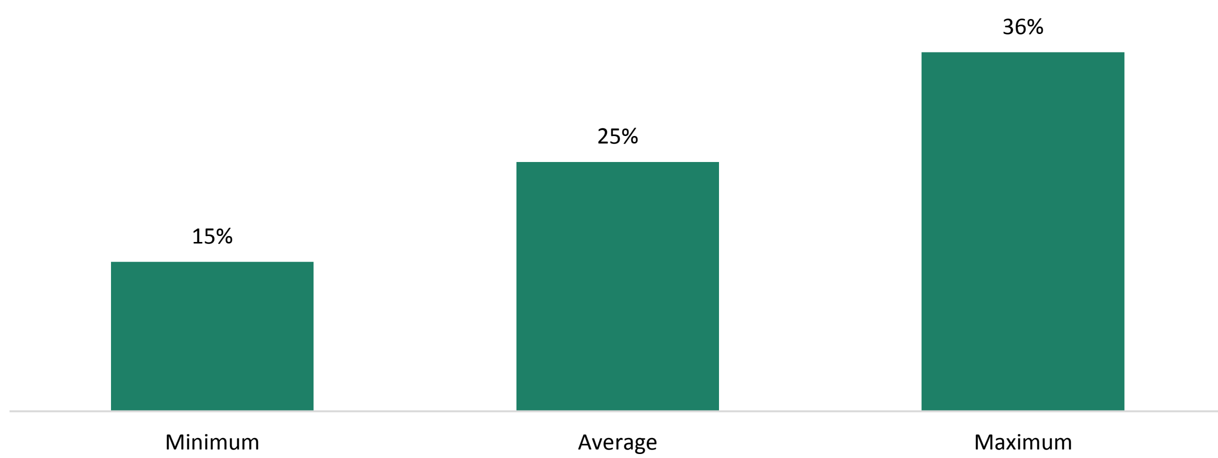
It should be clear, then, that even when samples are designed to produce 10% precision at 90% confidence, it is possible for two samples to produce noticeably different estimates of the same population value. One further point is important here, which is that a sample may be *designed* to produce 10% precision and 90% confidence but may not actually do so. This is because the level of precision is in large part a function of how variable the sample is with respect to the thing being measured – in this case, free-ridership. If most projects in the sample have similar levels of free-ridership, then there is low variability and good precision; but if the level of free-ridership is highly variable, then precision is not as good. Since the actual level of variability cannot be known in advance, researchers must base the sample design on the assumed variability. If that assumption is incorrect, then the assumed levels of precision and confidence also are incorrect.

4.1.2. Evidence of Variability in Researched Free-Ridership

The above background should help to put the following research findings in context. A review of free-ridership estimates across nine program types across multiple jurisdictions in the northwestern United States revealed notable variation in estimates across programs, in particular with custom programs (Cadmus 2017). This review of 13 custom C&I programs – seven in California, four in Oregon, one in New York, and one in Wisconsin – revealed a wide range of free-ridership estimates, from 11% for Energy Trust of Oregon industrial program in 2010 to 74% for a California Public Utility Commission (CPUC) agricultural custom program.

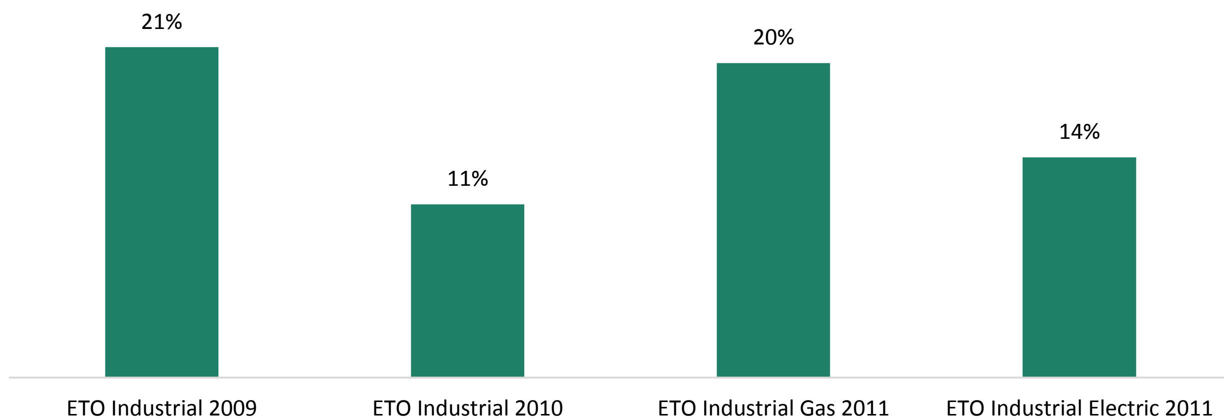
One program administrator, the CPUC, calculated the range of free-ridership for its agriculture and custom programs in 2009 to 2011. The values for the custom programs ranged from a low of 15% to a high of 36% (Figure 1). While this could reflect year-to-year differences in the programs' project make-up, it also likely reflects lack of precision in the estimates. Unfortunately, the report citing these values did not include estimates of precision, and the reference to the original source is no longer a live link. In any case, making policy or program planning decisions based estimates with so much year-to-year variability could easily lead to conflicting decisions.

Figure 1: Free-ridership Estimate Range for the CPUC's Agricultural and Custom Programs



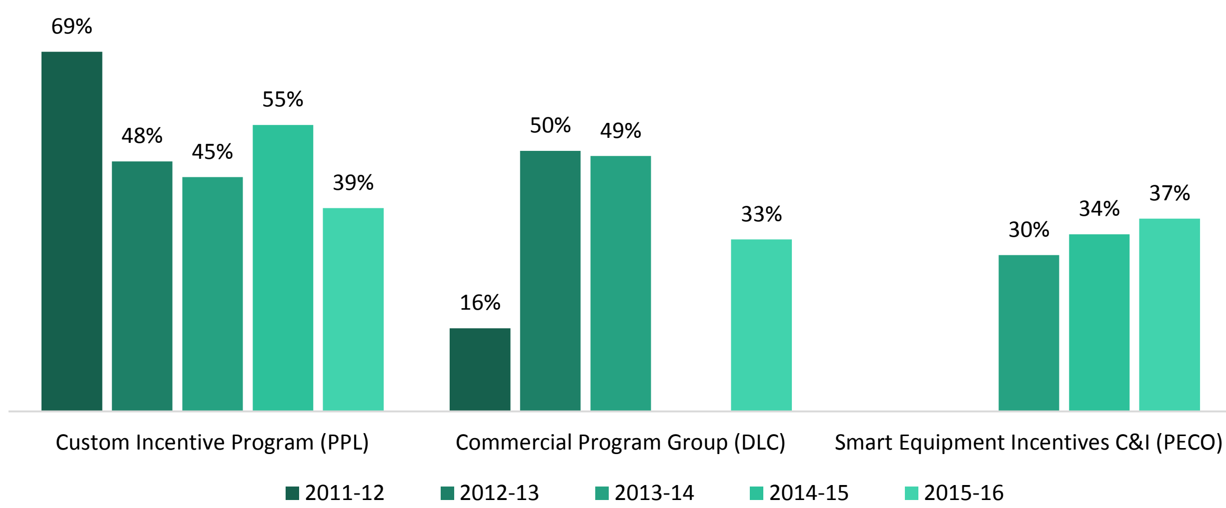
Examining a specific program's free-ridership values across multiple years sometimes shows variation that is difficult to interpret. For example, the free-ridership estimate for Energy Trust's Industrial program was 21% in 2009, dropped to 11% in 2010, and went back up in 2011 (Figure 2). Again, the year-to-year variability underscores the risk in relying on any specific estimate in determining the "true" free-ridership value.

Figure 2: Free-ridership Estimate for Energy Trust's Industrial Program, 2009-2011



Variability also existed in free-ridership estimates for C&I programs in several Pennsylvania utilities (Figure 3). As with the Energy Trust values, there was no clear pattern across utilities and years. For one program, free-ridership estimates trended down with a seemingly aberrant spike in the fourth year. For another, free-ridership tripled after the first year before falling to twice the starting point. For the third program, it slowly increased across years.

Figure 3: Free-Ridership Estimates for Pennsylvania Programs, 2011/12 to 2013/14



Sources: GDS Associates et at. 2014, 2015, 2016, 2017.

4.1.3. Exacerbation of Imprecision from Considering Spillover

The above subsection addressed free-ridership, but the lack of precision applies to spillover as well. In fact, spillover estimates may be even less precise than free-ridership estimates, as self-reported energy efficiency actions outside of efficiency programs are relatively low-frequency events. As Haeri and Khawaja (2012) point out, this means that a small *absolute* increase in spillover reported in a sample may result in a large increase in the spillover *percentage*.

Moreover, what is usually not considered is that a NTG estimate that includes both a free-ridership and spillover estimate (estimated separately) is not as precise as either the free-ridership or spillover estimate alone. That is because there are separate sources of variability for the free-ridership and spillover estimates that are combined when they are put together to form the NTG estimate.

Again, a slight digression into statistics is needed here. The precision of an estimate is a function of the *standard error* of that estimate. It is not necessary here to go into great detail about how the *standard error* is calculated, except to note that it is related to the *variance*, which is a measure of the variability of the sample component constituents – in this case, the individual free-ridership or spillover values that make up the sample – and to the sample size. When two estimates are combined, as when the separately estimated free-ridership and spillover are combined to estimate NTG, the variance around the combined estimate (the NTG in this case) is the sum of the variances of the components of that estimate (the free-ridership and spillover estimates).

Suppose, for example, an evaluation estimated free-ridership and spillover. Assume that samples of 68 observations generated estimated mean free-ridership and spillover values with 10% precision at 90% confidence. In both cases, the *variance* of the estimate is about .25, and so the *variance* of the NTG estimate is about .50, resulting in a precision of about 14% instead of 10%.

4.2. Spillover Is Not Sufficiently Accounted For

It is important to include estimates of spillover when free-ridership adjustments are made to ensure a balanced NTG ratio. Some evaluators have argued, and some regulators have accepted, that spillover and market effects balance out free riders (e.g., PWP and Evergreen Economics 2017; Khawaja, Haeri, and Hedman 2014; Haeri and Khawaja 2012). While there is as yet little empirical evidence for this argument, there is good theoretical reason to expect it is true. As an energy efficiency program succeeds in increasing trade allies' promotion of efficient equipment and end-users' recognition of the value of energy efficient investments, both self-reported free-ridership and spillover likely will increase (e.g., see Saxonis 2007). Yet, as documented below, not all states report spillover when estimating net savings. At the same time, current methods to estimate spillover may underestimate spillover savings.

4.2.1. Spillover Is Not Always Measured or Reported

When commissions/programs adjust gross savings by subtracting savings from free-riders, spillover should also be evaluated to provide for a balanced estimation of program effects (PWP and Evergreen Economics 2017; Kushler et al. 2014; and many others). One of the principles NEEP (2006) developed for estimating net savings is to "apply the concept of symmetry" which accounts for both positive (spillover) and negative (free-ridership) influences. Measuring free-ridership without accounting for spillover is not fully accounting for net program influences. Hence, retrospectively punishing programs for high free-ridership by reducing program-generated energy savings is considered “overly punitive” by some when the NTG ratio does not account for spillover (Khawaja, Haeri, and Hedman 2014, p.40).

Enbridge does not include spillover in its NTG analyses, which does not credit the program for the energy customers saved influenced by Enbridge programs (Synapse Energy Economics 2015). Participant and non-participant spillover is highly likely when programs have been in place for several years, as many prior participants are not still participating, yet were influenced to continue to pursue energy efficiency as a result (as in the case of Enbridge’s programs).

A growing number of states are recognizing the importance of including spillover estimates in their NTG ratios. Kushler et al. (2012) found that while 26 of the 39 states (67%) adjusted for free-riders, only 17 (44%) always included spillover. In a subsequent iteration of their survey, Kushler et al.(2014) found that 25 of 43 states include spillover (58%) and five more reported planning to. Table 1 displays which states adjust for free-ridership or spillover in their net savings, as reported by representatives in a phone survey.

Table 1: Reported Net Savings Adjustments by State*

Free-riders	Spillover	Number of States	States
Yes	Yes	33	Arkansas, California, Connecticut, District of Columbia, Florida, Georgia, Hawaii, Idaho, Kentucky, Maine, Maryland, Massachusetts, Michigan, Missouri, Montana, Nevada, New York, North Carolina, Oklahoma, Oregon, Rhode Island, South Dakota, Tennessee, Utah, Vermont, Wisconsin, Wyoming, and portions of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia
Yes	No	4	Colorado, Illinois, Indiana, New Mexico
No	No	12	Arizona, Delaware, Iowa, Kansas, Minnesota, Nebraska, New Hampshire, New Jersey, Ohio, Pennsylvania, South Carolina, Texas
No data		2	

* Adapted from Kushler et al. (2014).

4.2.2. Spillover Is Easily Underestimated with Current Methods

In a report documenting the results of a recent literature review and expert interviews, PWP and Evergreen Economics (2017) note that estimated participant spillover usually falls below 5% of gross savings, while non-participant spillover estimates “vary widely.”[7] It may be more likely that self-report methods underestimate spillover. Underestimations of spillover can derive from a reliance on the survey respondents’ attribution of influence to the program. As discussed in Section 3, because of the tendency

7 Although the authors report that some estimates of non-participant spillover exceed participant gross savings, such cases appear to be infrequent and may be limited to certain specific measure types, such as high-bay lighting (personal communication, Phil Degens, Evaluation Manager at Energy Trust of Oregon, August 15, 2017).

to rationalize past decisions, people tend to attribute energy efficiency decisions to themselves. This would be as likely lead to underestimation of spillover as overestimation of free-ridership.

Another reason is that self-report studies can identify only spillover activities done at the time of the survey. This is particularly problematic when a survey is conducted within the program year in which the respondent participated because it would not capture any spillover activities done after the survey but within the program year. To overcome this potential problem, a program might seek to conduct self-report surveys up to two years after program participation (Tetra Tech 2011). However, increasing the time that has elapsed between program participation and self-report surveys may lead to recall issues, with a resulting and greater tendency for the biases described in Section 3.

Bliss et al. (2017) argued that accurate survey-based spillover assessment must incorporate the perspectives of all parties involved in selling and installing energy efficient equipment – the equipment vendors, the installation contractors, and the end-users (program participants and non-participants). Specifically, in addition to assessing the program's direct influence on end-users, via marketing and outreach as well as learning the value of energy efficiency investments through program participation, accurate spillover assessment must assess the program's indirect influence on end-users via its influence on vendors and installation contractors. Accurate assessment of indirect influence must include assessment of: 1) the program's influence on the recommendations that equipment vendors and installation contractors make to their customers and on the recommendations that vendors make to contractors; 2) the equipment vendors' influence (through recommendations, stocking practices, and pricing) on installers; and 3) the vendors' and installers' influence (through recommendations, stocking practices, and pricing) on end users. Survey approaches that do not attempt to assess all those elements risk misestimating program influence.

Approaches that rely only on the end-users or the vendors and contractors, according to this view, cannot accurately estimate spillover because they cannot accurately assess both the direct and indirect pathways of program influence. While end-users are, at least nominally, able to identify program direct influence on their decisions (subject to the limitations identified in Section 3), they cannot report on the program's influence on vendors' and installers' practices, and so they cannot by themselves provide insights into program indirect influence. On the other hand, while vendors and installers can speak to the program's influence on their practices, they cannot report on the program's direct influence on end-users.

5. Policy Considerations and the Rationale for Negotiated NTG

This section discusses some of the policy considerations that proceed from, or are otherwise related to, the preceding discussion. First, some have concluded that the value of doing NTG research for a specific program year may not offset the cost. In addition, reliance on researched NTG, applied retroactively to gross savings, can generate conflict regarding the calculation and award of utility shareholder incentives. Following the discussion of the above issues, this section provides a summary of where negotiated or deemed NTG values have been used. Finally, this section addresses the related issue of how to attribute some portion of gas savings to parties other than the program in question and how that affects, if at all, the establishment of the NTG value.

5.1. The Value of Annual Primary Research May Not Justify the Cost

A primary reason for using NTG values is to accurately understand the amount of energy savings a program has generated so that policymakers can be sure ratepayer dollars are being spent in a cost-effective manner. However, conducting the studies uses a large portion of ratepayer dollars dedicated to EM&V (Messenger et al. 2010). Concerns over whether the funds spent on NTG self-report research justify the research costs, when deemed or negotiated values could be used instead, go back many years (e.g., Peters and McRae 2008; Messenger et al. 2010; SEEAction 2012) and continue to stimulate research and discussion (Violette et al. 2015; NEEP 2016).

Peters and McRae (2008) argued that funding self-report NTG research is not the most effective way of spending ratepayer dollars. Rather, research on motivations, behaviors, messaging, and intervention strategies may drive greater energy savings and would be a more cost-effective use of ratepayer funds. Two years later, though, this was still an open issue. In interviews with more than 80 energy efficiency experts, Messenger et al. (2010) found that those seeking more consistency in reporting impacts likely would encounter disagreement on using researched versus stipulated (deemed) NTG values.

SEEAction (2012) suggested that deemed NTG values are best used when “the expense of conducting NTG analyses and/or the uncertainty of the potential results are considered significant barriers.” (p. 5-7) The authors caution that deemed NTG values are potentially less accurate than research-based approaches, but do not cite specific data to support that claim. A possible basis for that suggestion is the concern that deemed values should be based on comparison to “similar programs, *hopefully* applied to similar populations with a similar level of efficiency adoption and during a time period similar to that of the program being reviewed” (emphasis added). In other words, the potential for inaccuracy may come from basing the analysis on programs that do not have sufficiently similar populations, over a time period that is not sufficiently similar. Despite this note of caution, the authors suggest that conducting NTG research every few years and using those findings to stipulate NTG ratios for the intervening years is acceptable, “as long as the market influences and participants’ behavior are relatively consistent” (SEEAction 2012, 5-7).

More recently, Violette and colleagues (Violette et al. 2015; NEEP 2016) have suggested that deemed or negotiated NTG values are sometimes close enough to the research-generated NTG value that policy decisions would be the same whether negotiated or original NTG values are used.

Violette et al. (2015) analyzed the costs and benefits of doing NTG research in Iowa compared to assuming a NTG value – in this case, a NTG value of 1.0. Specifically, the researchers compared the increased benefits of obtaining better NTG information to the cost of obtaining that information. The analytic model incorporated information on NTG values for similar programs in other jurisdictions to generate a distribution of probabilities for NTG values that differed from 1.0. The researchers then generated cost-benefit ratios under varying assumptions about research cost and rigor, research frequency, risk that true NTG departs from 1.0, and value of program design improvements resulting from NTG research. Under all scenarios, including ones with a low cost and high benefit of NTG research, the model indicated that the cost of annual NTG research outweighs the benefit for a custom C&I program, even compared to a deemed value of 1.0. Although the report does not consider the cost-benefits of NTG research compared to a deemed value of less than 1.0, it seems clear that it would weigh even more heavily in favor of the deemed value.

A guidance document on gross and net savings (NEEP 2016) expands on the earlier work by Violette et al. (2015). The authors of that document encourage utilities to consider the value of the information generated from NTG studies to determine whether the potential value/benefits of original NTG research outweigh the costs of conducting it. The authors recommend that policymakers consider the likelihood that original NTG research would produce information sufficiently different from current assumptions to result in program changes, and on that basis, consider whether updated gross savings and net savings information is needed to inform decision-making or whether spending ratepayer dollars on other types of research (e.g., market research) might be more valuable.

5.2. Reliance on Retroactive NTG Application Can Generate Conflict

Kushler et al. (2014) noted that conflict over net savings methods and results can arise – indeed, *has arisen* – when the results of net savings analyses have substantial financial impacts, such as on utility performance incentives or lost revenue recovery. Those authors noted:

> "Exacerbated by a policy of retroactively applying *ex post* estimates of free ridership, California degenerated into years of argument and litigation regarding the calculation and award of utility shareholder incentives." (p. 23)

Citing a study by the California Public Utility Commission (TecMarket 2010), Kushler et al. (2014) noted that the way in which NTG is calculated could mean the difference between nearly $400 million in earnings and a penalty of more than $100 million. Kushler et al. (2014) recognized that California's experience was an "extreme example," but even a less extreme experience can generate conflict. For those authors, avoidance of such conflict is one of the factors that has led to the "great proliferation" of deemed or negotiated NTG values in recent years.

5.3. Use of Negotiated NTG

Researchers observed strong trends among the US States in using deemed or negotiated NTG values for their programs or portfolios (Kushler et al.2012, 2014; SBW et al. 2013). In their review of 31 state's policies for estimating net savings, Kushler et al. (2012) found that 19 states use deemed values for their NTG ratios. Several of these states are listed in Table 2, all of which use deemed NTG values for their non-residential custom programs. Reportedly, regulators in Iowa and Arizona deem their NTG ratio at 1.0 because they "have accepted the argument that spillover and market effects balance out free riders" (Khawaja, Haeri, and Hedman 2014, 40).

Table 2: Use of Deemed/Stipulated NTG Values

State	Program(s) or Portfolio	NTG Value
Minnesota[a]	Portfolio	1.0
Arizona[b]	All programs	1.0
Iowa[b]	All programs	1.0
New Hampshire[c]	All programs	1.0
New Jersey[c]	All programs	1.0
New York[a,b]	All programs	.90
Michigan[a]	For all EE programs besides pilot, low-income, and education programs	.90
Hawaii[b]	All programs	.70

[a] Research Into Action, New Horizon Technologies, and Ridge & Associates (2013).
[b] Violette et al. (2015). Note that the information for Hawaii is not consistent with information in the Hawaii Energy 2014 Annual Report (Leidos 2014), which shows program-specific NTG factors and a composite NTG ratio of .78.
[c] Kushler et al. (2014).

Stipulated NTG values of 1.0 are common because many research studies estimating NTG factors have found that free-ridership and spillover roughly cancel each other out (Haeri and Khawaja 2012; Nowak and Witte 2014). Low-income programs and pilot programs targeting emerging technologies generally assume a NTG value of 1.0 because the target audiences demonstrate little free-ridership, as they are unlikely to purchase the newer, more expensive, energy-efficient products on their own.

In addition to the jurisdictions that explicitly identify a deemed NTG value, there are other jurisdictions that may require or encourage NTG research to inform program planning but do not apply NTG to assessments of program savings. In other words, these jurisdictions pay attention only to gross savings, not net, which is logically equivalent to having a stipulated NTG value of 1.0. For example, the Pennsylvania Utility Commission bases compliance with energy and demand reduction targets on gross verified savings, but it nevertheless requires Pennsylvania electric distribution companies to conduct NTG research to inform program design and implementation (GDS, Research Into Action, and Apex 2017). Similarly, as noted elsewhere in this report, utilities in the Pacific Northwest use deemed savings values that take into the account market baseline conditions, which includes free-ridership and spillover. In this case, gross reported savings based on the deemed values are net of free-ridership and spillover. Yet many of those utilities continue to conduct NTG research to inform program planning and implementation (e.g., Roy et al. 2016).

5.4. Attribution of Savings to Other Parties

Finally, it is important to clarify how the above relates to the discussion of "attribution" in the Ontario Energy Board's *Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2000)*. Section 7.2.2 of that document addresses "whether the effects observed after the implementation of a natural gas utility's DSM activity can be attributed to that activity, or at least partly results from the activities of others" (Ontario Energy Board 2014, 21).

The guidance presented in that section addresses two topics. The first – "attribution between rate-regulated natural gas utilities and rate-regulated electricity distributors" – is not relevant to this report, which is concerned only with the attribution of gas savings. Of concern to the present discussion is the second topic – "attribution between rate-regulated natural gas utilities and other parties (e.g., non-rate-regulated entities such as agencies and various levels of government, non-rate-regulated private companies, etc.)." Such other parties might include GreenOn, the Ministry of Environment and Climate Change, and any other large funding body that promotes energy efficiency in Ontario.

The *Filing Guidelines* state that natural gas utilities should establish partnership agreements with such other parties before program launch, specifying the shares (percentages) of natural gas savings to be allocated to the natural gas utilities and the other parties. If the percentage allocated to a given natural gas utility exceeds its percentage of total dollars spent by more than 20%, the utility should provide an explanation for the difference.[8]

Some attention has been paid to the question of sharing credit for energy savings among multiple influences (e.g., Skumatz and Vine 2010), although we identified no reports detailing a methodology for doing so. The important consideration for this issue, however, is whether the above reference to the allocation of natural gas savings refers to *gross* or *net* savings. The discussion in the introductory paragraphs of section 7.2 of the *Filing Guidelines* suggests that it refers to the *net* savings, as defined in section 2 of this report. Specifically, those sections refer to applying "attribution" as an adjustment factor separate from free-ridership and spillover. This seems to imply that the "attribution" adjustment, as defined above, would occur after adjusting for free-ridership and spillover.

We believe that such an approach is inconsistent with the meaning of *gross* and *net* savings as universally used in the energy efficiency evaluation community. In particular, it is inconsistent with the definition of free-ridership as the program-claimed savings that would have occurred without program assistance – meaning that net savings are those that occurred *only because of the program's assistance*. Another way of stating this is that the counterfactual in freeridership assessment theoretically incorporates all other influences, including the influence of those "other parties" identified above. Figure 4 illustrates this point.

Thus, we believe that the allocation of natural gas savings, as established in partnership agreements with other parties before program launch, should apply to gross program savings. Specifically, it should

8 The *Filing Guidelines* actually state that an explanation is needed when the natural gas utilities' allocated share of natural gas savings in the partnership agreement is "more than 20% of" (i.e., more than one-fifth of) the "percentage of total dollars spent" (p. 22). We believe this is not consistent with the example provided in a footnote of the *Filing Guidelines*, but the interpretation in the text of the current document is consistent with that example.

come out of the assessed free-ridership portion of gross savings. If done after the application of free-ridership adjustments, then the utility is penalized twice for the effects of the same external influences.

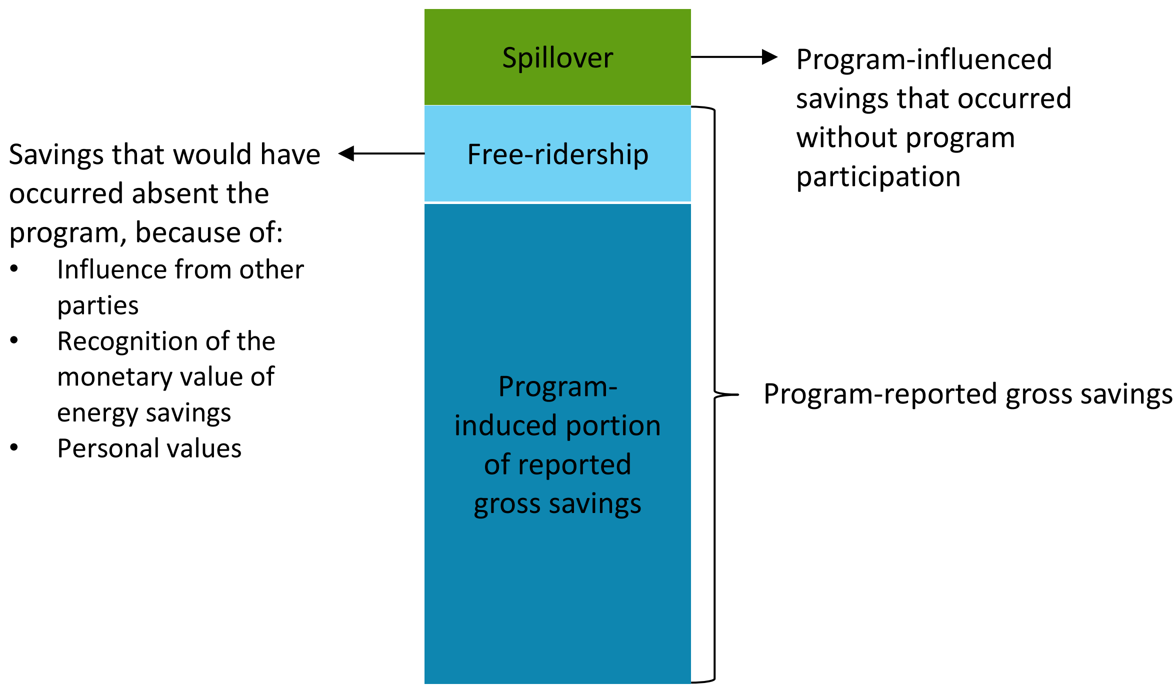


Figure 4: Components of Program Gross and Net Savings, Including Attribution to Other Parties

6. Conclusions and Recommendations

Regulators are rightly concerned about ensuring that energy efficiency programs not receive credit for energy savings that they did not cause. If there are no checks in place to ensure accurate assessment of attribution of savings, then program designers and implementers may not get the feedback needed to adjust and fine-tune programs to deliver the most savings possible for the dollars spent.

Yet the preceding sections of this report identify many potential problems with the way that net savings assessment has been conducted. Particularly problematic are self-report methods, which are very common for their low cost and ease of administration. Respondent self-selection bias as well as several very well-documented psychological propensities can easily result in over-estimation of free-ridership. A lack of statistical precision can produce estimates that may change notably from year to year. Spillover often is not included in NTG ratios and, when it is, it may very likely be under-estimated. Moreover, while the inclusion of spillover generally would increase the accuracy of a NTG estimate, it *decreases* the *precision* of NTG estimates because the separate estimates of free-ridership and spillover each contribute to the variance of the combined estimate. On top of all of the above – or perhaps, largely as a result of it – applying variable and unpredictable NTG adjustments retroactively can lead to conflict and litigation from dissatisfied shareholders.

Even apart from the above considerations, some evaluators (e.g., Violette et al. 2015) have concluded that the value of annual NTG research may not justify the cost. This conclusion applies even to self-report methods, which are probably the least expensive primary research methods to implement.

What, then, is the alternative to conducting program-year-specific primary NTG research? Based on our foregoing review and analysis, we offer the following recommendations to OEB and the natural gas utilities:

- **Develop a negotiated (also called “deemed” and “stipulated”) NTG value.** This value should be based on a range of inputs, including a review of researched NTG values from similar programs in comparable jurisdictions that account for free-ridership and spillover, at a minimum, but also market effects if possible. Assessment of applicable NTG values from multiple studies should not treat all inputs equally but should follow a meta-analytic approach, which includes reviewing the study quality, assessing study heterogeneity, and developing a pooled estimate of variability based on the variabilities reported in the studies. The pooled estimate is a better representation of what the true estimate is in the population and it can provide insight into variability around NTG that are important to consider when determining what the value should be. Part of reviewing study quality should include assessing efforts taken to reduce the self-report biases identified in section 3. Other inputs to the negotiated NTG value should include structured expert judgment and any available market data or macroeconomic analyses. In developing the negotiated value, it may be valuable to employ a “value of information” approach, such as described by Violette et al. (2015).
- **Allocate any savings to parties other than the program only from the free-ridership portion of gross savings.** By definition, free-ridership represents the program-claimed savings that would have occurred without program assistance, which must include savings attributable to other parties. Allocating savings net of free-ridership to other parties doubly penalizes the program.

As noted in the body of this report, establishing a negotiated NTG value does not preclude doing NTG research, as such research may be valuable for program planning and implementation as well as to inform periodic adjustments to the negotiated NTG value. We recommend that OEB and the natural gas utilities observe the following when NTG research is conducted:

- **Always include spillover and, if feasible, market effects assessments.** As documented in the body of this report, failure to account for these factors will underestimate NTG.
- **If using self-report, employ methods to reduce the bias toward high free-ridership.** Energy Trust of Oregon, with input from Research Into Action, Inc., developed an approach to free-ridership assessment that attempts to control for the high-free-ridership bias of other self-report methods in addition to reducing customer fatigue (see Bliss, McClaren, Folks, and Kociolek, 2015; Roy and Bliss 2012). This alternative approach balances the counterfactual assessment with a component that assesses the influence of the various program interventions, which typically produces a lower free-ridership estimate than the counterfactual (PWP and Evergreen Economics 2017).
- **Assess free-ridership as close as possible to project implementation.** The longer the time that has elapsed between the implementation of the project and the assessment of the decision-making that went into the project, the less salient the external influences (including the program influence) will be to the program participant and the more likely that participant will be affected by the biases toward free-ridership responses.
- **Use multiple methods and triangulate the NTG estimate.** The use of multiple methods, such as surveys of contractors as well as program participants, is now generally regarded as best practice among energy efficiency experts (Kushler et al. 2014; PWP and Evergreen Economics 2017).

Following the above recommendations may allow the natural gas utilities to continue offering large C&I customers in Ontario opportunities to generate high energy savings through custom programs that may not otherwise be achievable.

Works Cited

Baumgartner, R. 2013. "Survey Design and Implementation Cross-Cutting Protocols for Estimating Gross Savings." In *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures*, edited by T. Jayaweera, H. Haeri, pp. 12-1–12-25. Golden, CO: National Renewable Energy Laboratory (Subcontract Report NREL/SR-7A30-53827). Accessed at: www.nrel.gov/docs/fy13osti/53827.pdf.

Beggan, J. K. 1992. "On the Social Nature of Nonsocial Perception: The Mere Ownership Effect." *Journal of Personality and Social Psychology*, 62, 229-237.

Bliss, R., N. Sage, and D. Diebel. 2017. "Not all Spillover is the Same – So Don't Treat it That Way!" In *Proceedings of the International Energy Program Evaluation Conference*. Madison, WI: IEPEC.

Bliss, R., M. McClaren, J. Folks, and E. Kociolek. 2015. "From Real-time to Over-time: Developing a Four-year Perspective on an Energy Efficiency Portfolio." In *Proceedings of the International Energy Program Evaluation Conference.* Madison, WI: IEPEC.

Cadmus (The Cadmus Group, Inc.). 2017. *Assessment of Energy and Capacity Savings Potential in Iowa.* Prepared for The Iowa Utility Association. February 28, 2012. Accessed August 2, 2017 at: http://www.iowautility.org/wp-content/uploads/2016/05/Final-IUA-Joint-Assessment-Report-Vol.-1.pdf.

Dickerson, C. A., R. Thibodeau, E. Aronson, and D. Miller. 1992. "Using Cognitive Dissonance to Encourage Water Conservation." *Journal of Applied Social Psychology*, 22(11), 841-854.

Festinger, L. 1957. *A Theory of Cognitive Dissonance*. Evanston. IL: Row, Peterson.

Frisch, D. and J. Baron. 1988. "Ambiguity and Rationality." *Journal of Behavioral Decision Making*. 1 (3): 149–157. doi:10.1002/bdm.3960010303.

GDS Associates, Inc., Nexant, Inc., and Mondre Energy, Inc. 2014. *Act 129 Statewide Evaluator Final Annual Report, Phase I: June 1, 2009 – May 31, 2013*. Prepared for Pennsylvania Public Utility Commission. http://www.puc.pa.gov/pcdocs/1274547.pdf.

GDS Associates, Inc., Nexant, Inc., Research Into Action, Inc., and Apex Analytics, LLC. 2015. *Act 129 Statewide Evaluator Annual Report, Program Year 5: June 1, 2013 – May 31, 2014*. Prepared for Pennsylvania Public Utility Commission. http://www.puc.pa.gov/Electric/pdf/Act129/SWE_PY5-Final_Annual_Report.pdf.

GDS Associates, Inc., Nexant, Inc., Research Into Action, Inc., and Apex Analytics, LLC. 2016. *Act 129 Statewide Evaluator Annual Report, Program Year 6: June 1, 2014 – May 31, 2015*. Prepared for Pennsylvania Public Utility Commission. http://www.puc.pa.gov/Electric/pdf/Act129/SWE_PY6-Final_Annual_Report.pdf.

GDS Associates, Inc., Research Into Action, Inc., and Apex Analytics LLC. 2017. *Act 129 Statewide Evaluator Phase II Final Report*. Prepared for Pennsylvania Public Utility Commission. http://www.puc.pa.gov/Electric/pdf/Act129/Act129-SWE_PhaseII_FinalAR.pdf.

Haeri, H. and M.S. Khawaja. 2012. "The Trouble with Freeriders." *Public Utilities Fortnightly*. March 2012. Accessed August 2017. https://www.fortnightly.com/fortnightly/2012/03/trouble-reeriders.

Hall, N., L. Megdal, P. Jacobs, S. Waterbury, R. Wright, P. Chernick, K. Keating, S. Barata, E. Vine, S. Nadel, M. Kushler, R. Prahl, and J. Reed. 2004. *The California Evaluation Framework*. Retrieved August 8, 2017 from www.calmac.org.

Keating, K. M. 2009. "Freeridership Borscht: Don't Salt the Soup." In *Proceedings of the International Energy Program Evaluation Conference*. Madison, WI: IEPEC.

Khawaja, M.S., H. Haeri, and B. Hedman. 2014. "Finding Common Ground on Energy Efficiency." *Public Utilities Fortnightly*. December 2014.

Kunda, Z. 1987. "Motivated Inference: Self-serving Generation and Evaluation of Causal Theories." *Journal of Personality and Social Psychology*, 53(4), 636.

Kushler, M., S. Nowak, and P. Witte. 2012. "A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs." Prepared for ACEEE (American Council for an Energy-Efficient Economy). http://ilsagfiles.org/SAG_files/Subcommittees/IPA-TRC_Subcommittee/6-16-2015_Meeting/NEBs_Sources/ACEEE_2012%20report.pdf

Kushler, M., S. Nowak, and P. Witte. 2014. "Examining the Net Savings Issue: A National Survey of State Policies and Practices in the Evaluation of Ratepayer-Funded Energy Efficiency Programs." Prepared for ACEEE (American Council for an Energy-Efficient Economy). http://aceee.org/sites/default/files/publications/researchreports/u1401.pdf

Leidos (Leidos Engineering, LLC). 2014. Annual Report, Program Year 2014. Prepared for the Hawaii Public Utilities Commission by Hawaii Energy. December 11, 2015. https://hawaiienergy.com/images/resources/ProgramYear2014_AnnualReport.pdf

Messenger, M., R. Bharvirkar, B. Golemboski, C.A. Goldman, and S.R. Schiller. 2010. "Review of Evaluation, Measurement, and Verification Approaches Used to Estimate the Loan Impacts and Effectiveness of Energy Efficiency Programs." Lawrence Berkeley National Laboratory: Environmental Energy Technologies Division. LBNL-3277E. https://emp.lbl.gov/sites/all/files/lbnl-3277e.pdf

Miller, D.T. and M. Ross. 1975. "Self-serving Biases in the Attribution of Causality: Fact or Fiction?" *Psychological Bulletin*, 82, 213 – 225.

Ontario Energy Board 2015a. *Transition of Technical Evaluation Committee Activities to the OEB / EB-2015-0245.* Memorandum to Enbridge Distribution Inc., Union Gas Limited, Technical Evaluation Committee (TEC), and Evaluation Advisory Committee. March 4, 2016. https://www.oeb.ca/oeb/_Documents/EB-2014-0134/letter_TEC_EAC_Transition_20160304.pdf.

Ontario Energy Board 2015b. *Ontario Natural Gas Technical Evaluation Committee 2015 3rd Quarter Report.* March 10, 2016. https://www.oeb.ca/documents/TEC/Quarterly%20TEC%20Reports/Q3%202015%20TEC%20Report_March%20TEC.pdf.

Ontario Energy Board. 2014a. *Report of the Board: Demand Side Management Framework for Natural Gas Distributors (2015-2020) / EB-2014-0134*. December 22, 2014. https://www.oeb.ca/sites/default/files/uploads/Report_Demand_Side_Management_Framework_20141222.pdf.

Ontario Energy Board 2014b. *Filing Guidelines to the Demand Side Management Framework for Natural Gas Distributors (2015-2020) / EB-2014-0134*. December 22, 2014. https://www.oeb.ca/oeb/_Documents/EB-2014-0134/Filing_Guidelines_to_the_DSM_Framework_20141222.pdf.

Peters, J.S. and M. McRae. 2008. "Freeridership Measurement Is Out of Sync with Program Logic or, We've Got the Structure Built, but What's Its Foundation?" *In Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings.* Monterey, CA: American Council for an Energy-Efficient Economy. http://aceee.org/files/proceedings/2008/data/papers/5_491.pdf

Peters, J., R. Bliss, P. Degens, and S. Castor. 2010. "Faster Feedback: Real-Time Estimation of Free Riders." Poster presented at the Energy Efficiency Global Forum, Washington, DC, May 10-12.

PWP, Inc. and Evergreen Economics. 2017. *Current Methods in Free Ridership and Spillover Policy and Estimation*. Prepared for Energy Trust of Oregon. https://www.energytrust.org/wp-content/uploads/2017/07/FR_Spillover_170206.pdf.

Regional Technical Forum (RTF). 2010. *Methods for Evaluating Behavior-Based Energy Conservation Programs in the Pacific Northwest*. Retrieved August 3, 2017 from https://nwcouncil.app.box.com/s/qgolil20tzoqadphg2612jyxat8fp4jn.

Ridge, R., P. Willems, J. Fagan, and K. Randazzo. 2009. "The Origins of the Misunderstood and Occasionally Maligned Self-Report Approach to Estimating Net-to-Gross Ratio." In *Proceedings of the International Energy Program Evaluation Conference*. Madison, WI: IEPEC.

Roy, L., M. Johnson, P. Burns, J. Smith, W. Hodgson, C. Seruto, N. Benton, G. Sidorov, S. Hees, R. Bliss, and P. Schwarz. 2016. *Impact Evaluation of Washington Natural Gas 2014-2015 Energy Efficiency Programs*. Prepared for Avista Utilities by Nexant, Inc. with Research Into Action, Inc. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiBp9jf9OTVAhXJ5yYKHX-kD04QFggmMAA&url=https%3A%2F%2Fwww.utc.wa.gov%2F_layouts%2F15%2FCasesPublicWebsite%2FGetDocument.ashx%3FdocID%3D32%26year%3D2013%26docketNumber%3D132046&usg=AFQjCNF5GydBM7ln1-7sTchqghRnRH3v6w

Roy, L. and R. Bliss. 2012. "Findings, Challenges and Lessons Learned from the Evaluation of ARRA-Funded Programs for the Colorado Governors Energy Office." Paper presented at the AESP Annual Conference, February 6-9.

Saxonis, W. 2007. "Free Ridership and Spillover: A Regulatory Dilemma." In *Proceedings of the International Energy Program Evaluation Conference*. Madison, WI: IEPEC.

SBW (SBW Consulting, Inc.), Research Into Action, Inc., New Horizon Technologies, Inc., and Ridge & Associates. 2013. *Impact and Process Evaluation of NorthWestern Energy 2007-2011 Demand Side Management Programs.* Prepared for NorthWestern Energy. http://puc.sd.gov/commission/dockets/gaselectric/2012/ge12-001/vol1.pdf

Schwarz, N. 2007. “Retrospective and Concurrent Self-reports: The Rationale for Real-time Data Capture.” In A. A. Stone, S. S. Shiffman, A. Atienza, & L. Nebeling (Eds.), *The Science of Real-time Data Capture: Self-reports in Health Research* (pp. 11-26). New York: Oxford University Press.

SEEAction (State & Local Energy Efficiency Action Network). 2012. *Energy Efficiency Program Impact Evaluation Guide*. Prepared by Steven R. Schiller, Schiller Consulting, Inc., https://www4.eere.energy.gov/seeaction/system/files/documents/emv_ee_program_impact_guide_0.pdf.

Stone, J., A. W. Wiegand, J. Cooper, and E. Aronson. 1997. “When Exemplification Fails: Hypocrisy and the Motive for Self-integrity.” *Journal of Personality and Social Psychology*, 72(1), 54.

Skumatz, L. and E. Vine. 2010. “A National Review of Best Practices and Issues in Attribution and Net-to-Gross: Results of the SERA/CIEE White Paper.” Prepared for ACEEE (American Council for an Energy-Efficient Economy). http://aceee.org/files/proceedings/2010/data/papers/2078.pdf.

Synapse Energy Economics, Inc. 2015. *Ontario Gas Demand Side Management 2016-2020 Plan Review*. Prepared for Ontario Energy Board Staff. http://www.synapse-energy.com/sites/default/files/Ontario_Gas_DSM_Plan_Review_15-065.pdf.

TecMarket (The TecMarket Works Team). 2006. *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. Prepared for the California Public Utilities Commission. http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=5212

Tetra Tech, Inc. 2011. *Cross-Cutting C&I Free-Ridership and Spillover Methodology Study Final Report*. Prepared for Massachusetts Program Administrators. http://ma-eeac.org/wordpress/wp-content/uploads/Massachusetts-PAs-Cross-Cutting-CI-Free-ridership-and-Spillover-Methodology-Study.pdf.

Vine, E., N. Hall, K. Keating, M. Kushler, and R. Prahl. 2010. “Emerging Issues in the Evaluation of Energy-Efficiency Programs: The US Experience.” Published online November 26, 2010 at Springerlink.com.

Violette, D., K. Seiden, J. Erickson, M. Podolefsky, J. McMillan, S. Robinson, S. Dimetrosky, and N. Lieb. 2015. *Final Report: Iowa Energy-Efficiency Net-to-Gross Report.* Prepared for Iowa Utility Association and the Oversight Committee. September 2, 2015. http://www.iowautility.org/wp-content/uploads/2016/04/Appendix-B-Iowa-Net-to-Gross-Final-Report-11-25-2015.pdf.

Violette, D. and L. Agapay-Read. 2016. “Programme Attribution Analysis: Use of Self-Reports and Triangulation.” Presented at the *International Energy Policy & Programme Evaluation Conference*, Amsterdam, June 7-9. http://www.ieppec.org/wp-content/uploads/2016/05/Paper-Violette-1.pdf.

Violette, D. and P. Rathbun. 2014. “Estimating Net Savings: Common Practices.” In *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures*, edited by T. Jayaweera, H. Haeri, pp. 23-1–23-74. Golden, CO: National Renewable Energy Laboratory (Subcontract Report NREL/SR-7A30-53827). Accessed at: www.nrel.gov/docs/fy13osti/53827.pdf.

Northeast Energy Efficiency Partnerships (NEEP) 2016. "Gross and Net Savings Principles and Guidance." Prepared for Northeast Energy Efficiency Partnerships by Navigant Consulting and Tetra Tech, April 2016. http://www.neep.org/gross-and-net-savings-principles-and-guidance.

THE EVOLUTION OF NET-TO-GROSS
JURISDICTIONAL OVERVIEW OF APPROACHES

FINAL REPORT
for
Enbridge Gas Inc.

SeeLine Group Ltd

33 Longboat Ave
Toronto, ON,

Phone: 416.929.6675
Email: lkulperger@seeline.ca

Table of Contents

Executive Summary

This report provides an overview of mechanisms and approaches used to establish net-to-gross (NTG) rates for energy conservation programs across leading jurisdictions in the USA.[1] Additionally, the report includes analyses on the benefits and drawbacks associated with the various methods. Within the Ontario context, SeeLine Group Ltd (SLG) also focused importance on understanding the underlying framework conditions and drivers within which differing approaches are in use, such as how NTG results impact utility performance targets and incentives in other jurisdictions.

NTG evaluation practices used in other jurisdictions include:

- Self-report end user surveys
- Expert/Delphi Panel (deemed)
- Market effects (as proxy value or for consideration)
- Randomized Control Trials & Quasi-Experimental Studies
- Econometric modeling

Surveying customers to establish how much influence the program has had on participant and non-participant decisions is the most common evaluation mechanism used to establish the 'net' program results attributable to the program. Although it is the most common practice, many agree 'self report' surveys are far from perfect.

Recognizing the limitations that self-report surveys have in accurately measuring program net effects, or NTG, an increasing number of jurisdictions have shifted practices to either de-emphasize the importance of NTG from a policy standpoint, and/or provide a more balanced approach to evaluating it. From a policy standpoint, some jurisdictions have taken NTG out of the program performance incentive equation either by measuring 'gross' program results, or by locking-in NTG ratios against which performance is measured. Evaluation practices have broadened to incorporate more inputs to inform NTG ratios in addition to the traditional self-report survey evaluations. Stakeholder engagement has also evolved, with evaluation advisory committees becoming more commonplace, and their practices more formalized and procedural in nature.

Integrating market effect studies, such as changes in sales and stocking practices over time, and market share analysis of efficient versus baseline technologies are increasingly being considered in the establishment of NTG ratios, as is energy consumption econometric modeling – both micro and macro. Additionally, the inclusion of a Delphi panel or an advisory committee in the review of studies to come to an agreed upon NTG ratio is also gaining traction in leading jurisdictions.

[1]Based on two categories of the ACEEE scorecard: utility energy efficiency programs (top 10), and state level policies (top 2), ACEEE (2019), 2019 State Energy Efficiency Scorecard, and top 12 jurisdictions, https://www.aceee.org/research-report/u1908, Accessed March 2020

1. Introduction

Accurately measuring the motivation of a program participant's decisions has been an ongoing topic of debate within the utility-based energy conservation program community, intervenor stakeholders, evaluators, and government policy framework professionals. At the root of the debate is contention around how a utility performance incentive is impacted by evaluation studies weighing the influence programs have on participation. On the one hand, some stakeholder's express concern that a program administrator would be rewarded for participant actions that may not be attributed to the program. Conversely, program administrators may feel frustrated when blindsided by new net-to-gross (NTG) survey results that negatively impact performance incentive earnings because the results were incongruous with the NTG rates used to establish their performance targets and the measurement techniques are questionable.

How to measure the influence of program activities on customer decisions is often the crux of the issue. Evaluating the hypothetical question of 'what would have happened' absent a program is by no means a straightforward task, confounded by long standing program interaction with customers and a plethora of external drivers. *Did participation occur directly as a result of a program? Should a program be credited for spillover effects that influenced a customer to purchase a certain technology because of the program? Was the program inconsequential to a participant's decision to purchase the more efficient option, making them a "free rider"?* Determining cause and effect relationships is challenging at the best of times, and reliably doing so with accuracy is even more so.

Given the challenges outlined above, the objectives of this study were to provide:

i. An understanding of practices used to establish NTG across Canada and the USA.
ii. Insights into how NTG studies and processes are implemented and results are achieved/negotiated/scored.
iii. Available rationale for processes in place and how they came to be established.

These objectives were reviewed with two internal EGI stakeholder groups, along with the study research parameters and a high-level overview of current NTG practices, to validate the priorities of the study. In addition, the sessions provided an opportunity for stakeholders to share any insights or areas of focus to help direct the research. Findings in relation to NTG evaluation practices across 12 jurisdictions, and their associated benefits and draw backs are presented in this report.

2. Methodology

SLG used a stage-gate approach to this project, categorizing work into four phases as follows:

Phase 1, Discovery:

SLG has reviewed available research and relevant content commissioned for, and/or, collected by EGI to support phase two secondary research. This included current NTG evaluation survey instruments and scoring tools, associated evaluation protocols (as authored by the Board and the Evaluation Contractor), and any previous research undertaken for EGI and legacy Union Gas Ltd pertaining to NTG. EGI provided 86 documents during discovery, including 18 ESource responses associated with this project, of which, approximately 66 documents of relevance were reviewed to inform the workplan.

Phase 2, Secondary Research & Findings:

Based on information provided by EGI in discovery, SLG developed key research parameters to guide a secondary research scan of methods used to evaluate energy conservation program NTG across North America. Using an evaluation matrix approach in excel, SLG tracked relevant information associated with each field. Table 1 depicts two snapshots of the excel file that will be provided to EGI with the final deliverable.

Table 1, Research Matrix Snapshot

Delivery Agent	Framework	RA Program Specs	Target mechanisms	Cost effectiveness	NTG Factors
Name of entity	Considerations	Prescriptive, custom, mid-stream	How are they established How are they adjusted	Business case for legitimizing approach to market	free rider, insider spillover, outside spillover, other -- what is in, what is out

Evaluation Method	Quantification	Application of NTG	Timing	Maturity	Notes
self report, market effects, other	specifics about scoring methodology, focus on reasonable, equitable, emerging	Impacts targets, continuous improvement requirements, other	rapid feedback, longitudinal, etc.		Unique aspects, considerations, concepts

Description of research parameters noted in Table 1:

- Delivery Agent (regulated utility, third party, etc.)
- Framework considerations (performance incentive, pay-for-service, etc.)
- Program specifications (prescriptive, custom, mid-stream, self-direct, low income, etc.)
- Target Mechanisms (how are they established)
- Cost effectiveness (identify different models)
- NTG factors (Free ridership, inside spillover, outside spillover, etc.)
- **Evaluation method (self-report, market effects, other)***
- **Quantification methods (specifics about scoring methodology, focus on reasonable, equitable, emerging)**
- **Policy on NTG Application (impacts to targets, inform continuous improvement requirements, impacts to performance incentive)**
- Timing (rapid feedback, longitudinal, etc.)
- Program maturity considerations
- Notes (unique aspects, considerations, concepts and cost insights where available)

Note: Items in* ***bold* *are considered priority for this project*

SLG leveraged EGI's ESource subscription and spent time onsite with a representative from the DSM Evaluation team to conduct a document search of the ESource library to ensure the information gathered for this project is comprehensive. Throughout the secondary research phase, SLG captured relevant information to support the development of draft project findings. Sharing those findings prior to initiating phases three and four of the project provided the opportunity to refine the understanding of priority areas of interest to EGI to further explore in those phases. Research considerations identified through the stakeholder sessions are presented in Section 3.

Phase 3, Stakeholder Consultation:

SLG tailored content for three distinct internal EGI groups, based on draft findings and direction from EGI. Given their advanced understanding of NTG evaluation methods and the associated policy impacts, SLG engaged with the Policy/Evaluation team first to be sure to address their directional considerations and any specific areas of concerns. Following the Policy/Evaluation stakeholder session, SLG met with members of the DSM marketing teams to capture program considerations that may impact NTG measurement and share a high-level overview of preliminary project insights. The original workplan had included engagement with sales teams. In consideration of competing priorities, the sales session was deferred.

Takeaways from the stakeholder sessions included the desire to:

- provide more insights on how expert delphi panels and NTG negotiations function and are implemented
- ∗ compare and contrast how NTG policies impact performance incentives (Strategy and Evaluation group expected that the punitive nature of Ontario policy is an outlier)
- ∗ find any jurisdiction(s) that include a survey instrument as part of their EM&V Protocol that are used over the duration of the framework/plan period
- capture how frequently NTG is evaluated
- confirm whether any jurisdictions use macro-economic approach

**The group discussed and understands this is not the focus of the research.*

Phase 4, Primary Research & Reporting:

Informed by the first three phases of this project, SLG created a list of primary research questions and a proposed list of subject matter experts. SLG reviewed the focus of the primary research questions with EGI evaluation, before initiating contact with a short list of evaluation professionals with NTG expertise. At the time of drafting this report, the following experts had been interviewed:

- ✓ Scott Dimetrosky, Apex Analytics
- ✓ Dan Violet, Apex Analytics
- ✓ Jane Peters, Opinion Dynamics
- ✓ Jill Steiner, Public Sector Consultants
- ✓ Sami Khawaja, The Cadmus Group
- ✓ Ken Seiden, Navigant, a Guidehouse Company

In addition to evaluation professionals, the EGI Strategy team connected SLG with Ken Ross of Fortis BC who was also interviewed and provided insights into NTG related policy insights in British Columbia.

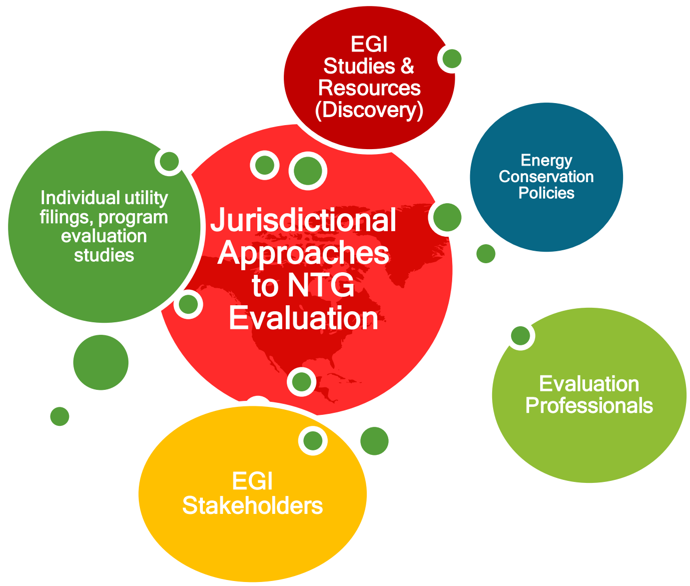


Figure 1, Research Inputs

The following section provides a distillation of the research gathered from the various source input to address the project objectives

3. Findings

By and large NTG evaluation practices have not changed dramatically, however there have been some significant policy shifts that correspond to evolving evaluation practices in an increasing number of jurisdictions, and in combination, these changes are leading the market towards de-escalating NTG related contention and creating more balanced and agreeable NTG determination processes. While the primary objective of this project was not to research and understand the driver underlying policy changes, SLG has attempted to document the drivers for trends relating to how NTG is applied when program performance is considered.

A relevant example from Massachusetts is one that will resonate with the Ontario experience as it pertains to a specific concern raised; some jurisdictions have expressed concern with the overlap between adjusting project baselines through both the gross evaluation process as well as the net.

> "*There may be some potential for "double debiting" partial efficiency FR for the measures with ISP baselines, that is, for downward biased NTGR, especially over time if NTGR remains frozen and ISP baseline tighten*." [2]

Considering this issue was raised in a jurisdiction where NTG results do not impact the utility performance incentive at all, it is interesting to note that the evaluator recommended improvements to the survey questions to address this concern for the following evaluation effort. SLG has included a discussion around known policy drivers at the end of this section.

Summary of Net-to-Gross Methods

Current practices across jurisdictions have revealed determining NTG through the following methods:

- Self-report end user surveys
- Expert/Delphi Panel (Deemed NTG)
- Market effects can include one or more of the following:
    - Upstream market actor surveys
    - Technology specific stocking practices
    - Technology specific sales data
    - Point of sales modeling[3]
- Randomized Control Trials (RCTs) & Quasi-Experimental Studies
- Econometric modeling

Although methods are not standardized across jurisdictions, self-report surveys remain the most common method employed to determine program or technology specific NTG ratios. An overview of each approach and their associated benefits and drawbacks is outlined below. A green triangle (▲) in the margin denotes the method has been found to be used with other approaches to 'triangulate' (i.e. inform with additional data points) the final NTG value. Following the description of the approaches, Table 2 presents a synopsis of jurisdictional practices associated with the various NTG methods.

3.1 Self-Report Approach

While the self-report approach (SRA) remains the most commonly practiced method for evaluating NTG, it is increasingly blended with other practices to support a more balanced perspective as a mechanism to reduce survey bias and other flaws associated with SRA. Some jurisdictions, such as Massachusetts and Illinois, have used standard survey tools and scoring algorithms that have been developed for specific programs.[4] It does not appear that

[2] DNV GL (2018), Baseline Transition Planning (P73), Net-to-Gross Revisions (Track C) Final Report, Massachusetts Program Administration and Energy Efficiency Advisory Council, http://ma-eeac.org/wordpress/wp-content/uploads/MA-CIEC-stage-5-report-Baseline-Change-Effects-on-NTG-20180917-FINAL....pdf Accessed March, 2020

[3] Point of sale modelling would fall within the definition of a 'microeconomic' approach for predictive market penetration rates over time. It considers data inputs such as baseline and upgrade technology specific sales data over several years (ideally in multiple jurisdictions with variable levels of efficiency program activity), program level activity in the area as defined by program budgets, demographics, and retail outlet accessibility.

[4] Tetra Tech et al (2017) Net-to-Gross Methodology Research, http://ma-eeac.org/wordpress/wp-content/uploads/Net-to-Gross-Methodology-Research.pdf p. 11, accessed March 2020.

any jurisdiction has done this across all programs within the portfolio. Additionally, attempts have been made to mitigate the inaccuracy risks of SRA practices as follows:

- Rapid Feedback: evidence suggests that participant decision making recall is more reliable as soon after the project installation as possible. This approach also reduces instances where the evaluator surveys a person who was not the actual decision maker due to employee turnover or multiple department involvement, which happens more frequently in larger capital projects.

Jurisdiction: Illinois, Massachusetts, and Oregon.[5] *British Columbia planning to implement.*

- Sensitivity Analysis & Multiple Scoring: Although good survey design should help eliminate over or under emphasizing of one or more question, undertaking a sensitivity analysis on the scoring algorithm will illuminate where scoring impacts are undesirable. To support greater confidence in the results, scoring responses should weigh multiple factors to account for the nuances of program influence on decision makers.

Jurisdictions: California, Illinois and New York have standard survey and scoring protocols.[6]

- Triangulation: Triangulation in the context of self-report surveys can refer to two separate concepts. Within the survey itself, questions are triangulated to try to eliminate survey response bias. Another method to validate survey results is to compare the findings with alternative methods for evaluating NTG.

Jurisdictions: Illinois, Massachusetts, New York, Michigan, Wisconsin, and Oregon

3.2. Expert/Delphi Panel (Deemed NTG)[7]

Stakeholder collaboration and input is not uncommon, and some jurisdictions have incorporated a more formal process as a step in the NTG evaluation process. While not consistent in every aspect, common to the processes is the opportunity to question, challenge, and suggest modifications to the initial estimates produced by an evaluation study with the ultimate goal of achieving consensus on the NTG value. This approach results in establishing a 'deemed' NTG value.

Stakeholder advisory committees in Illinois and Massachusetts include debate and discussions on results from multiple evaluation approaches to make recommendations on the NTG value. In Michigan, the process is facilitated by an evaluator electronically, and each

[5] Tetra Tech (2017), Massachusetts Cross-cutting Net to Gross Methodology Research: http://ma-eeac.org/wordpress/wp-content/uploads/Net-to-Gross-Methodology-Research.pdf accessed March, 2020
[6] New York: NYSERDA Clean Energy Council (2016), Evaluation, Measurement & Verification Guidance, p. 56, http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/255ea3546df802b585257e38005460f9/$FILE/CE-05-EMV%20Guidance%20Final%20%2011-1-2016.pdf, Accessed April 2020
Illinois: 2020 Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 8.0, p. 21, https://s3.amazonaws.com/ilsag/2020_IL-TRM_Version_8.0_dated_October-17-2019_Final_Volumes_1-4_Compiled.pdf Accessed April 2020
[7] Does not consider policy decisions to use standard 'deemed' NTG values for Low Income programs, which is common.

expert provides their opinion to the evaluator individually. An overview of these processes is described below.

Illinois: The Stakeholder Advisory Group (SAG) in Illinois is comprised of utility representatives and non-utility stakeholders, all of whom have equal standing. The process for establishing NTG values is based on consensus. NTG Values are produced annually by the independent evaluators, reviewed by the committee and finalized by October 1 of each year. New NTG values are prospectively effective January 1, three months after they are finalized. Evaluators are required to "take into account all comments and discussions**"**

Massachusetts: The Massachusetts Energy Efficiency Advisory Council also strives for consensus. If the 15 voting stakeholders cannot reach consensus, the decision will go to the majority and the committee will note concerns of dissention. Most often, the evaluation recommendation is adopted when full consensus cannot be achieved and there is supporting rationale to adopt.[8] In addition to the 15 voting stakeholders, each utility also has representatives. While utility representatives in Massachusetts do not officially have a 'vote', they are at the table and actively involved in the discussion. If the final decision is contentious, there is an opportunity to appeal the decision.[9]

Michigan: The Michigan process is somewhat unique in that the participants are industry experts rather than special interest groups, and the process enables each participant to share their perspective without the influence of discussion with the full group. Each participant is provided source studies electronically, asked to rank them in terms of value for informing NTG rates, and then provide the evaluation consultant a recommended NTG ratio. The evaluator compiles and reviews the recommendations and shares a proposed NTG value based on the input received. The process provides the chance for participants to question the proposed value via email, and provided the proposed

MICHIGAN DELPHI PANEL

Delphi Panel consists of 30 stakeholders, representing:

- Industry
- Utility Program Administrators
- Regulators
- Evaluation Community
- Environmental Groups

NTG value is informed by a variety of evaluation studies, such as:

- Market effects modeling, including:
    - price elasticity over time
    - program related product sales compared with non-incentivized options
    - stocking practices (baseline vs changes through program)

Studies are provided to Delphi Panel members electronically, and members rank the studies independently based on the perceived value of the report (relevance and robustness). Members submit their ranking to the evaluation consultant supporting the process, along with a recommendation for a NTG value with supporting rationale.

The evaluator reviews the input from all panel members, distills the information, and shares a recommended NTG value to the Panel with the basis for the recommendation. There is an opportunity for the panel to provide feedback if there is a disagreement but typically they will accept the NTG value.

NTG is applied prospectively.

[8] Based on interview with evaluation expert involved in the process.
[9] Massachusetts Energy Efficiency Advisory Council By-Laws, Amended February 25, 2015, http://ma-eeac.org/wordpress/wp-content/uploads/MA-EEAC-By-Laws-as-Adopted-2-25-15.pdf, Accessed March, 2020

value achieves general consensus, it is accepted and finalized.

Benefits:

- discussions are based on multiple inputs/studies which suggests a more balanced perspective
- reduced regulatory burden associated with contentious results
- inexpensive

Drawbacks:

- committees can be biased or influenced when results are being negotiated

Jurisdictions: Massachusetts, Illinois, Michigan, Rhode Island, New York, and Oregon

3.3 Market Effects

As seen in Wisconsin, program data is collected through the evaluation process to define the average market baseline (aka industry standard practice or standard market practice) as well as the average program installed energy consumption of specific measure categories. The difference between the two is adjusted to factor in distribution losses for which the program should not be penalized, and the resulting value represents the net program savings.[10] In the Pacific Northwest, they are expanding on this approach with a method called Momentum Saving

Benefits:

- provides insight into market changes over time to inform NTG negotiations
- can give insight into market penetration rates that should help program design in terms of incentive rates and when program has reached saturation.

Drawbacks:

- cannot be used to determine NTG on its own.

Jurisdictions: Connecticut, Minnesota, Massachusetts, Illinois, Michigan, Rhode Island, New York, Oregon, and Wisconsin

3.4 RCT & Quasi-Experimental Design

One of the best ways to evaluate the net effects a program has on the market is by conducting an RCT or a quasi-experimental design evaluation if there is an opportunity to do so. RCTs Both of these methods compare energy consumption between two groups. With RCT, the test is made up of a randomly assigned control group (not exposed to the program), and a program treatment group and energy consumption is monitored over time, with proportionate difference between the control group consumption and the treatment group representing the net program savings. A traditional RCT may not be an option where a program has been in field for a period of time, or where there is not the possibility of randomly setting up the groups. In these cases, a quasi-experimental design may be an appropriate compromise. Much like the RCT, the quasi-experimental design compares energy consumption for two groups with a defined

[10] Cadmus; Apex Analytics (2019) Focus on Energy Calendar Year 2018 Evaluation Report, Volume 1 (2019) https://focusonenergy.com/sites/default/files/WI_FOE_CY_2018_Volume_I.pdf. Accessed March 2020.

set of parameters – typically, this would be geography, but comparing historic participant consumption data with post program data may also be possible.

Benefits:
- low chance of bias
- high degree of accuracy
- widely accepted[11]

Drawbacks:
- takes time
- can be expensive
- best when planned before program implementation
- associated savings must be measurable compared with baseline behaviour

Jurisdictions: California, Ontario, Missouri.

3.5 Top-Down Macro-Econometric Modeling

Macro-econometric Modelling attempts to address net savings using overall energy use as a dependent variable over time compared to program related energy efficiency spending and program tracking data. The model produces the net savings, which does not separate free ridership or spillover factors. Data consistency and integrity present an obstacle for macro econometric modeling. In addition, this approach presents challenges in terms of identifying a correlation between the program efforts and energy consumption changes.[12] It is used most often to predict trendlines and validate existing bottom-up NTG evaluation results.

The following data are often used to undertake this analysis:
- large set of energy consumption data for specific sector over multiple years (5+ yrs)
- energy efficiency effort as defined by expenditures and/or ex-ante gross energy savings
- an understanding of the expected longevity of the savings triggered by the program
- matching program constituency demographic considerations to the data
- changes to codes and standards
- weather data

Benefits
- provide certainty regarding overall net energy savings over time
- useful to inform program efficacy, cost effectiveness of energy efficiency investments, and policy considerations
- can be useful to triangulate with bottom up studies to reveal natural market effects without the program related savings

[11] Technology savings have shown lower savings than anticipated in some regions, which may cause concern for technology manufacturers.
[12] Violet, Dan and Pam Rathbun (2014), *The Uniform Methods Project, Chapter 21: Estimating Net Savings: Common Practices*. National Renewable Energy Laboratory.

Drawbacks

- cannot be expected to illustrate measure or program specific attribution, particularly when multiple efforts are in market
- data consistency and integrity can be a problem, particularly for earlier data
- while there are limitations to the applicability of direct program attribution, where NTG adjustments do not impact the utility performance incentive, macro econometric modeling can provide clarity and greater confidence in the accuracy in terms of net energy savings over time.

Jurisdictions: California, New York, Massachusetts and Missouri. Underway in Wisconsin and planned for Indiana.

3.6 Micro-Econometric Modelling

Discrete Choice

A more simplistic model used to validate NTG levels is the Discrete Choice modeling, which uses available data to create a statistical model of market share. Information on program related market share can be compared with a participant's information and attitudes gathered from self-report surveys to predict the level of influence of a program. See Massachusetts case study in sidebar.[13]

Benefits:

- useful to help inform mid-stream and upstream free ridership

Drawbacks

- difficult to directly relate to the program influence when multiple programs are in place
- accuracy difficult to validate
- not commonly used

Jurisdictions: Illinois, Main, Massachusetts, Missouri, Wisconsin,

MASSACHUSETTS DISCRETE CHOICE MODEL

Using data gathered through the self-report survey, such as sociodemographics, information on housing stock, and motivation for participating in the program, the evaluation team created a discrete choice market share model, that in combination with the self-report survey results, was used to inform NTG for measures that did not overlap with other programs.

The difference between self-report survey results and the model, with the exception of the free ridership value associated with one measure, was quite pronounced – from 25 to 38 percentage points. Non-participant spillover was not provided through the survey, but through the model.

Price and Demand Elasticity Models

Price and Demand Elasticity models can be an effective way of establishing what would have happened in the market absent the program intervention, which can be interpreted to represent free ridership.

[13] Cadmus et al (2012), Home Energy Services Net-to-Gross Evaluation, p 12: http://ma-eeac.org/wordpress/wp-content/uploads/Home-Energy-Services-Net-to-Gross-Impact-Evaluation_Part-of-the-Massachusetts-Residential-Retrofit-Low-Income-Program-Area-Evaluation.pdf Accessed March, 2020

Data inputs include:

- observed prices and sales variation for program related measures before and/or after program implementation
- observed prices and sales variations across all comparable products over time
- program intervention data (e.g. location of events, budget, targeted marketing efforts, incentives, and sales channels, etc.)

By modeling program related variables, it is possible to read the direction of the market and predict the impact a program will have on sales demand and associated price impacts over time. The program related model is contrasted with a prices/sales forecast without program intervention to reveal an estimated level of free ridership.[14]

Benefits:

- appears to be reasonable to support triangulation of other studies

Drawbacks

- data consistency and integrity can impact the results
- relies on skills of modeler
- does not consider unanticipated externalities

Jurisdictions: Illinois, Main, Massachusetts, Missouri, and Wisconsin

3.7 Performance Incentive Policy Considerations

As previously described above, a variety of methods are available to support establishing NTG ratios for energy efficiency programs. The majority of these methods are inputs into the process and are not used exclusively as a NTG determinant, and not every method is appropriate in every circumstance. Despite concerns over response bias and scoring sensitivities with how results are quantified, self-report surveys remain the most common evaluation technique to study program-related influence within the top 12 jurisdictions in the USA,[15] as well as British Columbia.

Only two of the 13 jurisdictions reviewed for this study have performance incentive mechanisms (PIMs) that are impacted by outcomes of NTG studies, and with multiple incentive metrics in place, the NTG risk exposure to the utility is less extreme than the situation in Ontario. Increasingly, policy drivers are moving away from more punitive treatment of NTG on utility incentives, and broadening performance metrics to support government more government mandates.[16]

[14] Cadmus (2017), Ameren Missouri Lighting Impact and Process Evaluation: Program Year 2016, https://efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=936097118, p. 54, accessed April, 2020.

[15]Based on two categories of the ACEEE scorecard: utility energy efficiency programs (top 10), and state level policies (top 2), ACEEE (2019), 2019 State Energy Efficiency Scorecard, and top 12 jurisdictions, https://www.aceee.org/research-report/u1908, Accessed March 2020

[16] ACEEE (2018), Can Utilities Incorporate Energy Efficiency into their Core Business? With Performance Incentives, They Can. https://www.aceee.org/blog/2018/12/can-utilities-incorporate-energy Accessed March, 2020

While PIMs in some jurisdictions, such as Minnesota, Michigan and New York, rely solely on gross saving results, others use NTG studies for program design purposes and apply study results prospectively. Applying NTG adjustments prospectively to both targets and results is noted as a regulatory best practice and the current structure in Illinois, Massachusetts, Rhode Island, and partially in California.[17] Applying NTG to programs prospectively eliminates the regulatory burden associated with applying NTG studies retroactively,[18] while also providing comfort that the program is having the intended effect on the market and signaling when program design changes may be needed.

[17] Woolfe et al (2015), *Ontario Gas Demand Side Management 2016-2020 Plan Review*, p 118, prepared for the OEB. http://www.rds.oeb.ca/HPECMWebDrawer/Record/488716/File/document Accessed March, 2020

[18] MNR & Research Into Action (2012) Regional Net Savings Research: Phase 2: Definitions and Treatment of Net and Gross Savings in Energy and Environmental Policy,: https://neep.org/file/1086/download?token=8RQXuYXO Accessed Feb, 2020

Table 2. High Level Jurisdiction Synopsis of NTG Methods & Policy Considerations

		NTG Method							
Jurisdiction	**Impact on PIM**	**Self-Report End-Use**	**Survey Mkt Act**	**Market Effect**	**Delphi or Negotiat**	**RCT**	**Econo-metric**	**Other/Notes**	**Timing & Duration**
BC	NO	√		√				NTG does not impact utility earnings, but portfolio must remain cost effective - note, benefits in test are far more favourable than ON	
California	Partial	√	√				√ (pilot)	CPUC pre-screens custom projects for FR, PIM has 4 metrics, one is impacted by NTG partially for measures considered uncertain	Evaluation priorities established for 3 year plan period including NTG
Connecticut	NO			√				NTG recommendations can be based on research from other jurisdictions for prospective application.	Evaluation study has not been found, however recommendations in a regulatory filing note the desire to move to a Rapid feedback model
Illinois	NO	√	√	√	∇F		√	Change as of 2018 to prospective. TRM includes recommended multiple NTG approaches, survey design and scoring protocols.	
Maryland	NA	√	√	√				Utilities do not earn PI	
Massachusetts	NO	√	√	√	∇F		√ (in progress)	Aside from new construction and codes & standards, the utility does have a voice in the negotiations. Process is established and similar to Illinois, however available public	
Michigan	Partial	√	√	√	∇			See case study for more details	
Minnesota	NO	√	√	√				Goals and performance are based on gross savings. Adopted Illinois SRA method for NTG recently. NTG applied to cost test.	
New York	NO	√R			√		√	Goals and performance are based on gross savings. Have developed an SRA guide with scoring method	Use Self-report as soon as possible after the project has been completed to ensure decision maker is responding.
Oregon (3rd Pty)	NO	√R			√			Move to focus on MT programs.	Rapid feedback
Rhode Island	NO	√	√	√	∇			Use studies within the NEEP member utilities if RI studies are not available to inform negotiation	NTG set prior to 3 year plan period
Vermont (3rd Pty	NO	√				∇ *		NTG adjustments made to goals as well as results. RCT used with surveys for a lighting program in 2013.	
Wisconsin	NO	√	√	√			√	estimating net savings exclusively from survey results to approaches driven by sales data or an experimental design (national sales data	

Legend
R Rapid Feedback
∇ Multiple Inputs
F Formal process

4. Conclusion

The evolution of NTG policies is increasingly trending towards reducing or removing the financial risk of NTG evaluation from a utility's performance incentive to motivate performance without creating undue administrative burden on stakeholders and regulators. In addition to adopting more diverse inputs for NTG evaluation, policy shifts have removed the NTG risk through the adoption of one or more of the following:

- Multifactor performance incentives that reduce the impact that retroactive NTG studies have on the utility.

Jurisdictions: California, Massachusetts, Rhode Island, Vermont, and Michigan.[19]

- Using gross verified savings to evaluate the utility performance incentive rather than net, and,

Jurisdictions: Minnesota, Michigan, and New York

- Applying NTG adjustments prospectively to both targets and results. Noted as a regulatory best practice,[20] this eliminates the regulatory burden associated with applying NTG studies retroactively[21], while continuing to examine program influences to inform program design.

Jurisdictions: Massachusetts, Illinois, Rhode Island and partially for California.

> *"Relevant literature consistently recommends that best practice with regard to regulatory reporting is to maintain the planned input assumptions, at least for the savings on which performance incentives are based, especially with regard to free-ridership and spillover impacts."*
>
> *Wolf et al (2015)*

[19] ACEEE (2018) Snapshot of Energy Efficiency Performance Incentives for Electric Utilities, https://www.aceee.org/sites/default/files/pims-121118.pdf, p.3 accessed April 2020
[20] Woolfe et al (2015), *Ontario Gas Demand Side Management 2016-2020 Plan Review*, p 118, prepared for the OEB. http://www.rds.oeb.ca/HPECMWebDrawer/Record/488716/File/document Accessed March, 2020
[21] MNR & Research Into Action (2012) Regional Net Savings Research: Phase 2: Definitions and Treatment of Net and Gross Savings in Energy and Environmental Policy,: https://neep.org/file/1086/download?token=8RQXuYXO Accessed Feb, 2020

Considering the growing policy shift away from the punitive application of evaluation studies that are commonly understood to be flawed, it is important to reflect on the reason performance incentives are in place to begin with; they motivate utilities to focus on energy efficiency programs which would otherwise negatively impact utility earnings.

In recognition of the negative impact the NTG risk had driving energy efficiency efforts aggressively, the Massachusetts Department of Public Utilities (DPU) moved away from retrospective application of NTG evaluation results to utility performance incentives as of program year 2013.[22]

> *" The DPU accepted the argument that retrospective application of a NTG ratio creates uncertainty and puts program administrators at risk insofar as they invest in a program with an assumed NTG level that can later be revised downward. The DPU reasoned that this would encourage conservative program planning and implementation that would be unlikely to meet to the aggressive savings goals associated with the Green Communities Act."*
>
> *Department of Public Utilities, MA*

Policy mechanisms in which NTG evaluations have a high impact a utility's performance incentive can result in disputes that are costly and create a regulatory burden as exemplified by California. [23] Indeed, contention around how the NTG results would be applied was at the root of two successive deferral disputes in Ontario. The Ontario Energy Board ultimately supported the utility position that the NTG results not be applied retroactively and impact their performance target; however, the related proceedings were time consuming and expensive. [24]

> *"In Missouri the previous lack of an existing strong, consensus-based evaluation approach has led to a contentious process with different parties' evaluation experts providing differing views on which methods and estimates to use. Policymakers and regulators need to establish such strong evaluation frameworks and protocols that are integrated with the performance incentive mechanisms."*[1] Nowak et al, ACEEE

[22] MNR & Research Into Action (2012) Regional Net Savings Research: Phase 2: Definitions and Treatment of Net and Gross Savings in Energy and Environmental Policy,: https://neep.org/file/1086/download?token=8RQXuYXO Accessed Feb, 2020

[23] See California example, Orvis, Robbie (2016), Avoiding Counterfactuals in Performance Incentive Mechanisms: California as a Case Study, https://americaspowerplan.com/wp-content/uploads/2016/04/AvoidingCounterfactuals-white-paper.pdf, Accessed March 2020

[24] Nowak et al (2015), Beyond Carrots for Utilities: A National Review of Performance Incentives for Energy Efficiency, ACEEE, https://www.aceee.org/sites/default/files/publications/researchreports/u1504.pdf, Accessed Feb 2020

Lessons from Ontario and other jurisdictions support the concept of revising the regulatory framework as it pertains to the NTG application to remove disputes that can be burdensome on the regulators and challenging for rate-payers when associated delays create a bottleneck for financial clearances. Furthermore, having clearly defined evaluation processes and protocols would similarly avoid confusion and contention. The effectiveness of the various evaluation processes will largely be determined by the clarity in the roles and protocols established that guide them.

Sources Cited

ACEEE (2019), 2019 State Energy Efficiency Scorecard, https://www.aceee.org/research-report/u1908, Accessed March 2020

ACEEE (2018), Can Utilities Incorporate Energy Efficiency into their Core Business? With Performance Incentives, They Can. https://www.aceee.org/blog/2018/12/can-utilities-incorporate-energy Accessed March, 2020

ACEEE (2018) Snapshot of Energy Efficiency Performance Incentives for Electric Utilities, https://www.aceee.org/sites/default/files/pims-121118.pdf, p.3 accessed April 2020

Cadmus (2017), Ameren Missouri Lighting Impact and Process Evaluation: Program Year 2016, https://efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=936097118, p. 54, accessed April, 2020.

Cadmus (2018) Focus on Energy Calendar Year 2018 Evaluation Report VOLUME 1, https://focusonenergy.com/sites/default/files/WI_FOE_CY_2018_Volume_I.pdf. Accessed March 2020. It is unclear how distribution loss factor (in this case 8%) was determined.

Cadmus; Apex Analytics (2019) Focus on Energy Calendar Year 2018 Evaluation Report, Volume 1 (2019), https://www.focusonenergy.com/sites/default/files/WI_FOE_CY_2018_Volume_II.pdf accessed February 2020

Cadmus et al (2012), Home Energy Services Net-to-Gross Evaluation, p 12: http://ma-eeac.org/wordpress/wp-content/uploads/Home-Energy-Services-Net-to-Gross-Impact-Evaluation_Part-of-the-Massachusetts-Residential-Retrofit-Low-Income-Program-Area-Evaluation.pdf Accessed March, 2020

DNV GL (2018), Baseline Transition Planning (P73), Net-to-Gross Revisions (Track C) Final Report, Massachusetts Program Administration and Energy Efficiency Advisory Council, http://ma-eeac.org/wordpress/wp-content/uploads/MA-CIEC-stage-5-report-Baseline-Change-Effects-on-NTG-20180917-FINAL....pdf Accessed March, 2020

Eversource Energy et al (2019) 2020 Plan Update to the 2019-2021 Conservation & Load Management. https://www.energizect.com/sites/default/files/CTEvalRoadmap_Final_2014_Updated_Dec2014.pdf pg. 55, Accessed March 2020

Illinois Energy Efficiency Policy Manual Version 2.0 (2019), https://s3.amazonaws.com/ilsag/IL_EE_Policy_Manual_Version_2.0_Final_9-19-19.pdf Accessed April 2020

Illinois: 2020 Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 8.0, p. 21, https://s3.amazonaws.com/ilsag/2020_IL-TRM_Version_8.0_dated_October-17-2019_Final_Volumes_1-4_Compiled.pdf Accessed April, 2020

Massachusetts Energy Efficiency Advisory Council By-Laws (2015), http://ma-eeac.org/wordpress/wp-content/uploads/MA-EEAC-By-Laws-as-Adopted-2-25-15.pdf Accessed March 2020

MNR Group Inc (2018) RLPNC 17-11 LED Net-to-Gross Consensus Panel Report, http://ma-eeac.org/wordpress/wp-content/uploads/RLPNC_1711_LEDNTGConsensus_30JUNE2018_final.pdf Accessed April 2020

MNR Group Inc (2018) R1707 Net-to-Gross Study (NTG) of Connecticut Residential New Construction, https://www.energizect.com/sites/default/files/R1707%20NTG%20Study%20for%20CT%20RNC_Final%20Report_10.5.18.pdf Accessed April, 2020

MNR Group Inc & Research Into Action (2012) Regional Net Savings Research: Phase 2: Definitions and Treatment of Net and Gross Savings in Energy and Environmental Policy,: https://neep.org/file/1086/download?token=8RQXuYXO Accessed Feb, 2020

New York: NYSERDA Clean Energy Council (2016), Evaluation, Measurement & Verification Guidance, http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/255ea3546df802b585257e38005460f9/$FILE/CE-05-EMV%20Guidance%20Final%20%2011-1-2016.pdf p. 56, Accessed April 2020

Nowak et al (2015), Beyond Carrots for Utilities: A National Review of Performance Incentives for Energy Efficiency, ACEEE, https://www.aceee.org/sites/default/files/publications/researchreports/u1504.pdf, Accessed Feb 2020

Orvis, Robbie (2016), Avoiding Counterfactuals in Performance Incentive Mechanisms: California as a Case Study, https://americaspowerplan.com/wp-content/uploads/2016/04/AvoidingCounterfactuals-white-paper.pdf, Accessed March 2020

Tetra Tech et al (2017) Net-to-Gross Methodology Research, http://ma-eeac.org/wordpress/wp-content/uploads/Net-to-Gross-Methodology-Research.pdf p. 11, accessed March 2020.

Tetra Tech (2017), Massachusetts Cross-cutting Net to Gross Methodology Research: http://ma-eeac.org/wordpress/wp-content/uploads/Net-to-Gross-Methodology-Research.pdf accessed March, 2020

Violet, Dan and Pam Rathbun (2014), *The Uniform Methods Project, Chapter 21: Estimating Net Savings: Common Practices*. National Renewable Energy Laboratory.

Woolfe et al (2015), *Ontario Gas Demand Side Management 2016-2020 Plan Review*, p 118, prepared for the OEB. http://www.rds.oeb.ca/HPECMWebDrawer/Record/488716/File/document Accessed March, 2020

Appendix A. Expert Panel Policy Case Studies

Evaluation experts interviewed for this study agree that having an advisory group oversee evaluation activities is a common occurrence, however finding clear documentation around the implementation and processes that guide the activities does not appear to be as common. During research for the NTG practices, SLG found formal evaluation policy documentation for Illinois and Massachusetts, and an overview of the documentation is included here for EGIs reference.

Massachusetts Energy Efficiency Advisory Committee (MA-EEAC)

The MA-EEAC has a dedicated website that publishes related activities, and includes governance by-laws and meeting ground rules for the committee and its various sub committees.[25] The by-law stipulates that the committee consists of 15 voting members plus representation from utility program administrators. In practice, it appears the utility program administrators are included in the consensus process discussions for establishing NTG according to evaluation experts. One LED NTG evaluation report does outline the consensus process and shows utility involvement to the extent that their recommendations be considered. [26] For ease of reference, the process is outlined below:

Consensus process:
The process outlined in the LED NTG Consensus Panel Report includes six steps as follows:

- Step 1 Confirmation of Methods to Inform Process:
- Step 2 Identification and Recruitment of Experts: The utility reps, EEAC consultants, and evaluation consultant (EC) discussed involvement of various actors in the NTG consensus process, including EEAC, program planners, program implementers and implementation contractors. While program planners were excluded from the process, program implementers were involved in the process to provide estimates of market share with and without the program. Program implementers were otherwise not directly involved in the NTG consensus process.
- Step 3 Compilation of Study Results: After completion of the preliminary NTG estimates, the EC provided a synopsis of the approaches and results, including values from other jurisdictions. The panel considered the content and provided direction on other information for the EC to look into further.
- Step 4 Solicitation of Initial Responses: in consideration of Step 3, the EC presented the panel with a revised synopsis of NTG estimates. Panelists each then submitted

[25] Massachusetts Energy Efficiency Advisory Council By-Laws (2015), http://ma-eeac.org/wordpress/wp-content/uploads/MA-EEAC-By-Laws-as-Adopted-2-25-15.pdf Accessed March 2020
[26] MNR Group Inc (2018) RLPNC 17-11 LED Net-to-Gross Consensus Panel Report, http://ma-eeac.org/wordpress/wp-content/uploads/RLPNC_1711_LEDNTGConsensus_30JUNE2018_final.pdf Accessed April 2020

their own NTG estimates for a variety of LED bulbs and included rationale for their choice (considering the background information, evaluation studies, etc).

- Step 5 Consensus on NTG: the submitted estimates were compiled by the EC along with the reasoning for the value, and the information was shared back with panel members. The panel met to discuss findings and the future of the market and come to consensus on prospective NTG values and strategies.
- Step 6 Reporting: The final values were then published in a report that also documented the process.

Consensus agreement is the primary operating objective of the EEAC. In cases where consensus cannot be reached, the Council will operate by majority vote, where a quorum is required, and a majority of the voting members is sufficient to approve or reject a proposal. The by-laws outline the voting requirements in greater detail.

Illinois Statewide Advisory Group (SAG)

Similar to Michigan, the SAG in Illinois also has a dedicated website to document their activities. Illinois has published a second edition of the Statewide Energy Efficiency Policy Manual[27] that explicitly outlines the roles and responsibilities of SAG membership. It notes that the SAG is not a decision making body, rather it is a "forum that allows parties to express different opinions, better understand the opinions of others, and foster collaboration and consensus, where possible and appropriate." There are a number of committees and groups that operate within the constructs of the SAG, including:

- SAG Steering Committee – guides activities to meet SAG goals, including feedback to the facilitator in establishing the SAG plan and progress
- Large Group SAG – includes program planning, funding changes, reporting
- SAG Technical Advisory Committee – TRM and technical EM&V focus.
- SAG Sub-committee – topic specific and established as needed
- SAG Working Groups – work to resolve short-term issues, including recommendations to other committees

The Policy Manual provides guidance on many policy considerations for associated energy efficiency activities, from committee membership, portfolio planning, cost effectiveness, facilitator independence, and evaluation policies – such as the "NTG Collars" around savings adjustments. The collars are designed to enable targets to be adjusted to reflect changes in TRM and NTG values in a formulaic manner within the plan period. Changes in savings and NTG values are applied prospectively, and the NTG Collar mechanism enables the utility to adjust targets.

[27] Illinois: 2020 Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 8.0, p. 21, https://s3.amazonaws.com/ilsag/2020_IL-TRM_Version_8.0_dated_October-17-2019_Final_Volumes_1-4_Compiled.pdf Accessed April, 2020

STAKEHOLDER ENGAGEMENT

Stakeholder Engagement in the Development of the DSM Plan

1. On May 21, 2019, the OEB issued a letter initiating a policy consultation process to develop a new DSM framework for natural gas distributors beginning in 2021. In the letter, the OEB stated that Phase 1 of the consultation process would include a stakeholder meeting (June 13, 2019) followed by a request for written comments from interested parties on a list of prescribed issues (June 27, 2019).[1] On September 16, 2019 the OEB issued a letter stating that consultation on the new DSM Framework was expected to continue in 2019 and 2020.[2]

2. On December 19, 2019 the OEB commenced Phase 2 of the Post-2020 Natural Gas DSM Framework consultation process seeking input from stakeholders on the OEB's consultation plan and general framework issues and held a one-day stakeholder meeting on January 28, 2020.[3] On December 1, 2020 the OEB concluded the stakeholder consultation phase of the Post-2020 Natural Gas DSM Framework consultation in favour of an adjudicative process that would commence after Enbridge filed a new multi-year DSM plan application.

3. Throughout the 2015-2020 DSM Plan and 2021 DSM Plan application, Enbridge Gas continued stakeholder efforts to stay well-informed of changing customer needs and market conditions. In anticipation of proposing the new DSM Plan, Enbridge Gas undertook stakeholder engagement to seek feedback on the DSM program offerings, complementary to the OEB led stakeholder consultation of 2019 and 2020.

[1] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (May 21, 2019), p. 2.
[2] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (September 16, 2019), p. 2.
[3] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 19, 2019), p. 2.

4. Given the timing between the conclusion of the OEB-led stakeholder consultation on December 1, 2020 and the requested submission date for the new DSM Plan, Enbridge Gas has been limited in the time available to engage stakeholders for a comprehensive review of proposed program updates and other topics for the new DSM Plan. Therefore, following the direction received from the OEB in December 2020, the Company has focused stakeholder activities in select areas, specifically: i) refinement on proposed changes to the Low Income program, ii) the development of the Pay for Performance offering, and iii) consultation on the Large Volume program.

5. The stakeholder engagements and feedback compiled throughout the 2015-2020 DSM Plan and 2021 DSM Plan application are too numerous to summarize in this application, however the valuable insights and input received have been considered in the development of this application. The relevant feedback heard through the course of the OEB Post-2020 Natural Gas DSM Framework consultation, Phase 1 and 2 (EB-2019-0003) has also been considered.

<u>Low Income Program Stakeholder Consultation</u>

6. In March 2021, Enbridge Gas held individual meetings with representatives from the following low income customer associations:
   - Low-Income Energy Network (LIEN) - March 17;
   - Vulnerable Energy Consumers Coalition (VECC) - March 18;
   - Housing Services Corporation (HSC) - March 19; and,
   - Federation of Rental Housing Providers of Ontario (FRPO) - March 24.

   The purpose of these meetings was to provide an update on proposed changes contemplated for the next multi-year DSM Plan, and seek feedback ahead of the submission to refine program design and program delivery strategies.

7. The first key update was regarding alignment of participant eligibility criteria for the Low Income program consistent with the Tier 1 income-tested electric CDM program eligibility requirements. This proposal is in line with expectations provided by the OEB in its DSM Letter[4] and consistent with the Ministerial Directive issued to the IESO on September 30, 2020.[5] All stakeholders consulted were pleased to see harmonization of DSM and CDM single-family income eligibility criteria and to learn that discussions are underway between the IESO and Enbridge Gas to examine possible coordinated program delivery.

8. The second key update was regarding the proposed modification to eligibility criteria for privately-owned multi-residential buildings in the Affordable Housing Multi-Residential offering. Enbridge heard concerns from stakeholders during the 2015-2021 DSM term that the current geotargeted approach had the potential to be problematic, and that more screening safeguards were needed to ensure that buildings which did not have a high incidence of low income residents were not inappropriately classified as low income buildings. The modified eligibility criteria now include a building rent roll review to verify that at least 30% of units rented, are less than 80% of the median market rent (as reported by the CMHC).

9. The Company received positive feedback on this approach from all stakeholders consulted and received confirmation from FRPO that building owners/property managers should be able to provide a rent roll, and the updated eligibility requirement should not pose a barrier to participation. It was acknowledged that privately-owned multi-residential buildings could alternatively qualify through proof of participation in other federal or provincial affordable housing programs, or proof of rent supplements.

---

[4] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 4.
[5] MC-994-2020-1084, Ministry of Energy, Northern Development and Mines, Office of the Associate Minister of Energy (November 27, 2020), p. 2.

10. The third key update discussed concerned a new proposal for an Affordable Housing New Construction offering. All stakeholders were pleased with the inclusion of the offering and did not express any concerns.

11. In addition to providing updates on offerings proposed for the new DSM Plan, Enbridge Gas and stakeholders discussed how to raise awareness of DSM among hard-to-reach single family customer groups such as visible minorities, new immigrants and refugees, senior citizens, and veterans. LIEN suggested that Enbridge Gas work closely with local faith-based organizations to reach new immigrants and refugees as these can be organizations that they are familiar with and trust. VECC suggested that Enbridge Gas work with the Ontario Coalition of Senior Citizens that represents 160 senior groups to raise awareness among senior citizens, versus attempting to target individual senior citizens. For hard-to-reach multi-residential customers, FRPO suggested Enbridge Gas work closely with municipal associations to raise awareness among small to mid-sized privately owned multi-residential buildings.

12. Enbridge Gas was pleased to hear from HSC that the Affordable Housing Multi-Residential offering design as contemplated was more accessible to customers with low energy efficiency knowledge and customers who are unsure of where to start. HSC noted this was positive relative to some other programs in market that are overly complex and difficult to navigate, and therefore pose a barrier to participation.

13. FRPO shared that a key component to influencing building owners or property managers to undertake DSM is to educate building tenants on the benefits of energy efficiency improvements in the building. FRPO suggested that empowering tenants with energy education is an effective way to promote smaller savings within the

building, but it can also encourage a cultural shift within the building community that can influence the building owner to make energy improvements.

14. For the purposes of the next DSM Plan, LIEN indicated that it was interested in proposing that any budget planned for the Low Income program should be ring fenced, such that Enbridge Gas would not reallocate any funds earmarked for Low Income DSM programming to other programs. Enbridge Gas has no reservations adhering to this budget guidance with respect to the Low Income program in an effort to ensure that spending is dedicated for the benefit of low income customers and has included LIEN's proposal in this DSM Plan application.

15. One of the stakeholder groups indicated it was interested in revisiting lowering the TRC threshold for the Low Income program. Enbridge Gas raised the idea to other low income stakeholders, and none expressed concerns regarding revisiting the threshold as part of the regulatory proceeding. Recognizing that the costs of the Low Income program are born by all rate payers and in an effort to balance the interests of the broader stakeholder group, Enbridge Gas's proposed plan does not include any recommended change to the existing 0.7 Low Income program TRC-Plus screening threshold at this time.

16. Enbridge Gas has considered the various discussion points and comments received and will incorporate where appropriate as part of continuing efforts to refine offerings. A copy of Enbridge Gas's low income consultation presentation can be found in Attachment 1.

Pay for Performance ("P4P")

17. In March 2021, Enbridge Gas held individual meetings with business partners, Enerlife, and Efficiency Engineering, as well as one of the largest schoolboards in southern Ontario. A copy of Enbridge Gas's Whole Building P4P consultation

presentation with these stakeholders can be found in Attachment 2. The Company had previously collaborated with Enerlife on its Sustainable Schools pilot to test aspects of performance-based programming, and Efficiency Engineering was one of the delivery agents for the previous Run-it-Right offering. Enbridge Gas was eager to engage with the schoolboard to hear customer insights on the proposed P4P design concepts. The purpose of the meetings was to share draft design and delivery concepts of the Whole Building P4P offering and seek feedback from both a delivery agent and customer perspective.

18. Stakeholders were supportive of the proposed P4P concepts including that capital and operational improvement opportunities should be addressed together in one offering allowing for a holistic whole building assessment. Stakeholders also agreed that the identification, prioritization and implementation of any and all capital or operational improvements should continue over a period of time and measurement should be extended beyond a single participation year in order to encourage sustained achievement of targeted performance objectives. Stakeholders agreed that the multi-year approach would help to encourage a cultural change among participants.

19. Stakeholders were in favour of the inclusion of a charrette as a key component of participation, acknowledging this collaborative workshop is an important opportunity to drive engagement and commitment from all parties involved, particularly the decision-makers. This approach would also provide an opportunity to look at the building as a whole to identify underlying issues and assess what areas may not be performing optimally.

20. Some stakeholders maintained that the initially proposed performance target per building was too high. Enbridge Gas has incorporated that feedback into a more

achievable but challenging building performance target as part of the proposed offering.

21. Stakeholders expressed differing preferences to incentive design. Enerlife preferred back-end incentives over upfront incentives to encourage sustained focus on the achievement of multi-year energy savings. Conversely, Efficiency Engineering suggested higher upfront incentives be included to overcome financial barriers, especially in consideration of higher cost capital measures. Enbridge Gas considered the feedback provided by stakeholders in the final incentive design and schedule.

22. Feedback from the schoolboard cautioned Enbridge Gas that capital improvement plans developed by school boards are usually on three to five year cycles and operational budgets are determined annually. This planning cycle could pose a barrier to participation, despite having significant interest in undertaking operational improvements. Representatives from the school board also cautioned that the longer duration of the offering may impact participation engagement and potentially results due to potential staff turnover.

23. Stakeholders agreed that in addition to financial incentives, the technical support provided by Enbridge Gas to identify operational improvement opportunities is a highly valuable component of the offering.

<u>Large Volume Program</u>

24. Enbridge Gas engaged a number of large volume customers and stakeholders in recent months to provide an overview of the proposed Direct Access offering. A copy of Enbridge Gas's consultation presentation with large volume stakeholders can be found in Attachment 3. During these one-on-one discussions, Enbridge Gas sought input on proposed modifications to program elements including revisions to incentive

budgets and increased flexibility around the utilization of funds. The Company also asked stakeholders to describe the value they perceived in various aspects of the programming and to highlight aspects of the current programming that they hoped to see continue. Stakeholders were also asked for input regarding barriers and opportunities observed in the market currently.

25. The feedback was decidedly mixed, and it is therefore difficult to reconcile into a single program offering proposal. Some representative groups were opposed to paying for any DSM programming at all, stating that there is enough legislation, cost and incentive for them to perform energy efficiency without additional costs from the utility. Others were supportive of increasing funding to the Large Volume program so that it would increase influence on more efficiency projects.

26. Along with modifications to increase flexibility in the types of projects eligible in the offering, Enbridge Gas is proposing a reduction in the incentive budget and total Direct Access offering budget for the base year, with inflationary increases for the remainder of the multi-year DSM Plan term as a reasonable compromise.

27. Other than the budget/costs associated with DSM programming, many customers were generally in agreement that the proposed changes would be beneficial. 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. These stakeholders also indicated they are supportive of the Aggregate Pool (“Ag Pool”) and would like to see it remain in the updated offering.

<u>Proposal for Future Formal Stakeholder Consultation</u>

28. In recent years Enbridge Gas has heard feedback from stakeholders interested in reintroducing a more formalized utility-led general stakeholder consultation, as was

the practice in previous frameworks prior to 2015. The Company agrees there is value in hosting a formal consultation by way of a General DSM Stakeholder meeting in addition to its regular on-going engagement with customers. Enbridge Gas proposes to annually host a half-day General DSM Stakeholder meeting to be scheduled following the completion of the Draft Annual DSM Report, typically submitted in April of each year.

29. Upon completion of the Draft Annual DSM Report, stakeholders and Enbridge Gas will have the latest program year results to discuss achievements, areas for improvement, program updates, changes in the market place and other topics as required to maintain effective communication and solicit feedback in an effort to ensure DSM plans are continuing to achieve objectives and meeting the needs of customers. The intention is that interested stakeholders would be extended an invitation to the General DSM Stakeholder meeting with an agenda outlining relevant topics to be communicated ahead of time.

Enbridge’s Low Income Program Offers 2022+

DSM Stakeholder Update
March 2021

Draft Content only for Stakeholder Discussion

Prepared by Enbridge Gas Inc.

Context and Goals

ENBRIDGE

- Board's December 1st Letter: *"The OEB invites Enbridge Gas to file a comprehensive multi-year DSM plan application for the OEB to review new conservation programs, budgets, and targets for the post-2021 period*."

- Enbridge is finalizing a suite of comprehensive and customer-centric offers for the Low Income sector for its post-2021 application, including:
  - Single-Family Offer (Social Housing and Privately Owned)
  - Multi-Family Offer (Social / Non-Profit Housing and Eligible Privately Owned Buildings)
  - New Construction (Single Family & Multi-Residential)

Today's Goals:

- In advance of our DSM Filing for Low Income:
  - Provide some context regarding direction of our Offers and engage in selected discussion topics

Draft Content only for Stakeholder Discussion

Low Income Sector Strategy

ENBRIDGE

- Assist low income Ontarians by making their homes more energy efficient in order to help better manage their energy bills
- Identify and address unique needs and challenges of serving this customer segment
- Ensure accessibility to programming to achieve widespread customer participation, including harder-to-reach customers
- Offer a universal, seamless customer experience across the province
- Provide turnkey solutions for participants, including no, or low-cost direct install elements
- Coordinate with electric CDM programming and other partners where appropriate
- Minimize lost opportunities for energy efficiency in Affordable Housing New Construction
- Include education and energy literacy among all offers

Single Family Offer

ENBRIDGE

- Continue Home Winterproofing offer in next DSM Multi-Year Plan
  - Focus on weatherization measures and continuing to find these eligible customers
  - Target Market: Privately owned homes and Social & Non-Profit Housing Providers
  - Indigenous Single Family homes on and off-Reserve will also be eligible

Discussion: Guidance to help find these sub-sectors of the market?

- Update Low Income Eligibility Criteria from LICO +35% to LIM-BT + 35%
  - Alignment with IESO CDM Income Eligibility (Ministry & OEB direction)
    - Opportunity for EAP/Home Winterproofing coordinated delivery across the province for 2022

# of People in Household	Income-Qualified Single Family 2019 Before Tax (BT) LIM + 35%
1	$36,578
2	$51,729
3	$63,354
4	$73,157
5	$81,791
6	$89,598
7+	$96,775

Alignment with IESO CDM programming (per Board's December 1st Letter and CDM Framework):

> *"OEB expects that Enbridge Gas will endeavor to coordinate the delivery of DSM programs with electricity CDM programs where possible, including modifying the participant eligibility requirements of its current low-income program in order to be consistent with the electricity income-tested CDM program eligibility requirements"*
> – Board Letter

Draft Content only for Stakeholder Discussion

Multi-Residential Offer

ENBRIDGE

- Continue enhanced offering directed to Multi-Residential buildings with Low Income residents:
  - Target Market: Social & Non-Profit Housing Providers, and privately-owned Multi-Residential Buildings
  - Continue to offer an array of Prescriptive & Custom measures, along with opportunities for Direct Install and Building Assessments

- Updating eligibility criteria for privately owned Multi-Res building to access Low Income funding/programming to establish a consistent screening methodology province-wide
    - Privately owned multi-family building owner or property manager must confirm 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, based on rent roll review, demonstrating average rent levels; **OR**
    - Existence of Rent Geared to Income or rent supplement contract(s) with the designated Service Manager Office; **OR**
    - The building has participated in one of the Affordable Housing Federal or Provincial funding programs.
  - In addition to confirmation of one of the above, the property manager or building owner must confirm agreement to forego AGI (Above Guideline Increase)

Discussion: Comments on updated eligibility criteria for privately owned Multi-Res buildings

Draft Content only for Stakeholder Discussion

New Construction Offer

- Continue to encourage increased energy efficiency in Affordable Housing New Construction through updated Affordable Housing Savings By Design offer
  - Helps to address the unique challenges of the Affordable Housing New Construction market
  - Key program elements include:
    - Visioning Session and IDP (Integrated Design Process)
    - Technical Assistance Incentive and Energy Performance Incentive

- Program Updates may include:
  - Expanding province-wide
  - Updated Incentives
  - Increased performance requirement

Thank you

Whole Building P4P

Offer Concept

ENBRIDGE
Life Takes Energy

March 2021

- *Draft Content for Stakeholder Discussion*

Offer Overview

- Holistic approach to energy management
- Leverage meter and building data to drive deep savings and improve overall building performance
- Focus on customers with high energy intensity levels, and help them towards top-quartile performance of the sector
- Help customers to better understand and prioritization energy savings opportunities, including behavioural, operational and/or capital measures
- Provide technical support through implementation
- Measure performance based on in-situ savings measured at the meter

Offer Elements

Program Duration	Multi-year Program (2-year implementation, 3-year M&V)
Initial Target Sector	MUSH (homogenous sub-sectors)
Performance Target	30%
Pre-screening	• Target customers with high energy savings potential (>30%) via benchmarking analysis • Develop baseline model that meets minimum statistical requirement
Metering & EMIS	• Interval Data (i.e. daily) requirement for M&V, EMIS system for better energy monitoring • EGI to fund costs
Incentive Structure	• *Tier 1 – Implementation Incentives* - based on estimated/calculated savings per implemented measure • *Tier 2 – Performance Incentive* - based on measured (M&V) in-situ incremental savings at the meter each year compared to baseline/previous
Opportunity Identification Phase	• 3rd Party Delivery Agent to engage customers to identify and prioritize list of opportunities (i.e. via charrette)
Implementation Phase	• Customers to implement measures, leveraging 3rd Party for technical support • 3rd Party to quantify and estimate/calculate savings from measures • Tier 1 incentive provided based on EGI approved estimated savings
Performance Incentive	• 3rd Party to quantify yearly savings via M&V and provide report • Tier 2 incentive provided based on EGI approved M&V results

Large Volume DSM

Next Generation Program

ENBRIDGE
Life Takes Energy

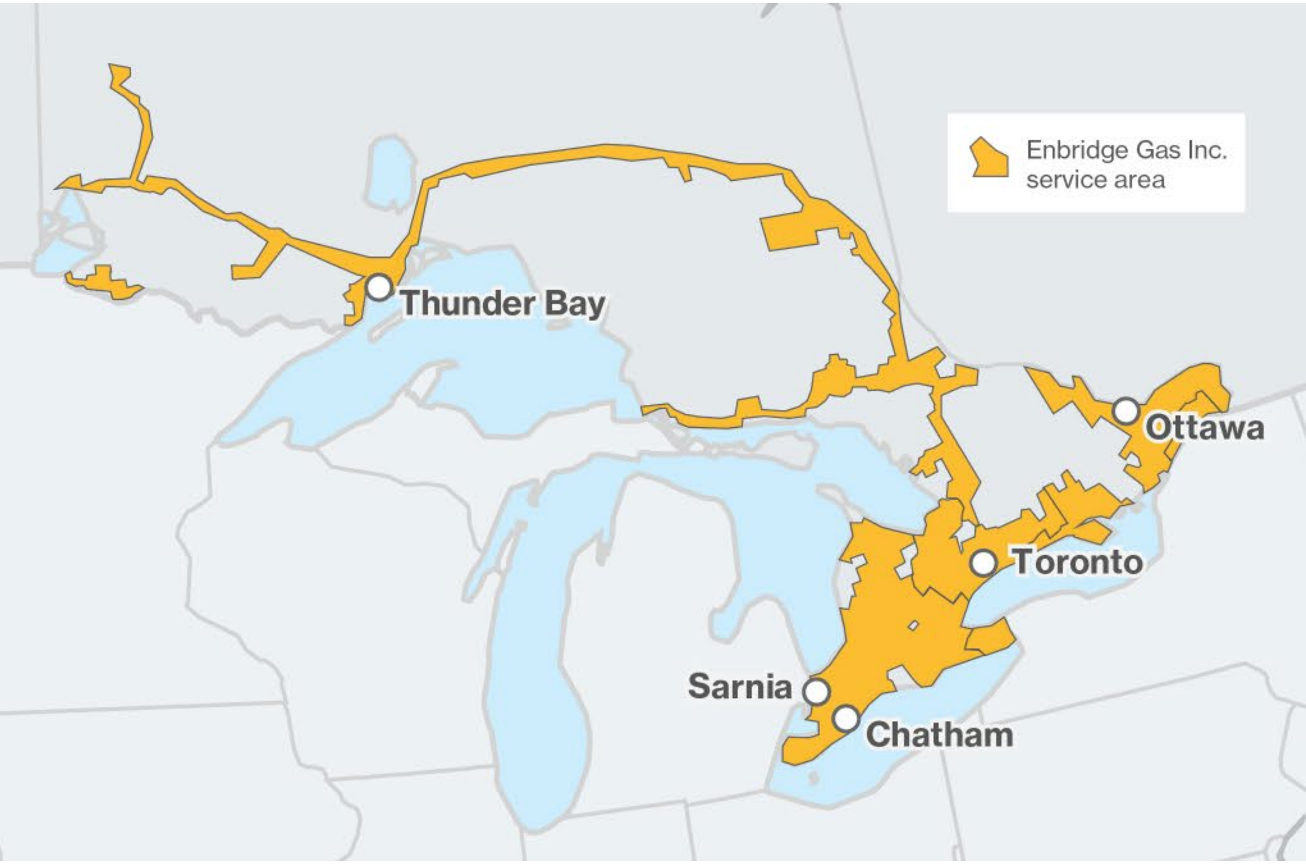
January 27, 2021

Enbridge Gas Inc.

North America's largest natural gas storage, transmission and distribution company

We deliver the energy that enhances people's quality of life.

- **Values**
  Safety, Integrity, Respect.
- **Experience**
  170+ years of experience in safe and reliable service.
- **Distribution Business**
  3.8M customers, heating >75% of Ontario homes.
- **Dawn Storage Hub**
  Canada's largest integrated underground storage facility and one of the top natural gas trading hubs in North America.
- **Advancing Innovative Low-Carbon Solutions**
  Conservation, cleaner technologies for heat/transportation (CNG, geothermal), green fuels (RNG, hydrogen).



Formed Jan. 1, 2019 from the amalgamation of Union Gas Limited and Enbridge Gas Distribution.

2022+ DSM planning – Current Status

OEB direction supported by joint guidance letter by MENDM & MECP:

- File a multi-year DSM plan by May 1st, 2021

Primary Objective: Assist customers to be more efficient

Secondary Objectives: Lower average annual gas usage, help meet Ontario's GHG reduction goals and create opportunities to defer/avoid gas infrastructure

".. the OEB's main objective for DSM is relevant to all Ontario natural gas customers"

"The OEB anticipates modest budget increases to be proposed ……in order to increase natural gas savings"

- Development of an application in progress based on Board's direction

Broad support for/commitment to long term Utility led conservation programs

Filed: 2021-05-03, EB-2021-0002, Exhibit E, Tab 4, Schedule 6, Attachment 3, Page 4 of 8

Next Generation Program Concept

Current Program

- Direct Access budget is set annually for each customer
- Customers work with Enbridge to create Energy Efficiency Plan (EEP)
- Incentives paid based on execution of EEP
- Annual audit to verify calculated savings

Proposed Changes

- Reduction of Program Budget
- Expanded list of Eligible Measures

 Filed: 2021-05-03, EB-2021-0002, Exhibit E, Tab 4, Schedule 6, Attachment 3, Page 5 of 8

Next Generation Program Concept

Reduction of Program Budget

- Proposing to reduce from $3.15M to $2.5M
- Direct Access budget set annually for each customer
- Incentives paid on execution of EEP
  - Fixed incentives for Studies, Meters, Training and Pilots
  - Project incentives based on annual natural gas savings

Next Generation Program Concept

Expanded list of Eligible Measures

- Customers are encouraged to bring all projects forward in their EEP
- Customers continue to receive incentives for enablement activities
    - Studies, Meters, Training and Pilots

 Filed: 2021-05-03, EB-2021-0002, Exhibit E, Tab 4, Schedule 6, Attachment 3, Page 7 of 8

Next Steps

- Customer Engagement
- Soliciting feedback
- Application Submission by May 1st, 2021

Discussion

2019 ACHIEVABLE POTENTIAL STUDY

1. Beginning in early 2018, and ending in late 2019, the IESO and the OEB led and completed the first Integrated Ontario Electricity and Natural Gas Achievable Potential Study ("2019 APS"). The 2019 APS' intended goal was to "provide data and analysis to inform the development of future conservation policy and/or frameworks; program design, implementation and evaluations; long-term resource planning; and system operations."[1] To this end, the study sought to quantify potential energy savings, including both electricity and natural gas, as well as resulting GHG emission reductions between the years of 2019 and 2038.

2. In the OEB's DSM Letter Enbridge Gas was invited to develop and file a comprehensive DSM Plan starting in 2022[2], the 2019 APS was referenced as one of many inputs that the Company should consider when reviewing current and potential future suite of programs although the study itself was not "determinative" on its own.[3]

3. In efforts to comply with that direction, Enbridge Gas sought to use as many 2019 APS data inputs and assumptions as possible to inform DSM planning, but found that adjustments to the 2019 APS dataset were required to better reflect the Company's knowledge and experience of the Ontario DSM market.

4. To further consider the 2019 APS and the potential adjustments that Enbridge Gas felt might be needed, Posterity Group ("PG" or "Posterity") was engaged to provide their expertise and support. Leveraging Posterity team member's decades of experience leading Ontario conservation potential studies, their knowledge of the 2019 APS study as a member of the Expert Panel, and their proprietary modelling

[1] IESO and OEB Foreword to the 2019 Achievable Potential Study (September 30, 2019), p. 3.
[2] EB-2019-0003, OEB Letter Post-2020 Natural Gas Demand Side Management Framework (December 1, 2020), p. 2.
[3] Ibid, p. 5.

software, Posterity, built a mirrored model (“PG model”) of the 2019 APS. This was undertaken to better understand and reconcile some of the discrepancies found in the 2019 APS study so that it could be used to inform future planning activities. Posterity’s final report is filed as Attachment 1 to this exhibit.

5. Some of the challenges associated with incorporating the unadjusted 2019 APS dataset and outputs into future program planning, and budget/target forecasting efforts, included: the misalignment of reference case sector structure and assumptions, measure assumptions that are not substantiated or not applicable, and program delivery cost assumptions that don’t reflect historic experience.

6. In the 2019 APS, reference case sector definitions and assumptions did not align with how Enbridge Gas designs, delivers, and reports on program offerings. For instance, in the 2019 APS:
   - The Residential Sector was made up of – Single Family Residential, Multi-Residential, Single Family Low Income, and Multi Family Low Income segments all combined under one sector.
   - Additionally, Large Volume and Industrial customers were not disaggregated from one another.

7. Additionally, under Scenario A (“SCA”), the 2019 APS assumes declining incentive and administrative costs over time for many measures. Said another way, the 2019 APS SCA assumes that with a constrained budget, over time, the utility will become more cost effective. This does not align with Enbridge Gas’s historic experience. When considering another budget constrained Scenario C (“SCC”), this same assumption did not hold true.

8. Review of measure level input assumptions, and potential savings outputs highlighted additional need for departure from APS assumptions. Enbridge Gas has

included just a few key callouts for consideration below (based on an analysis of SCA potential from 2022 to 2028).

9. High Efficiency Fireplace with Pilotless Ignition was identified as the third most impactful measure to drive savings within the Residential sector, expecting to account for ~18% of overall savings, and the second most in the Low Income Single Family sector accounting for ~23% of overall savings. However, as a result of Amendment 15[4] updates, published on June 12, 2019, less than 3 months after the release of the 2019 APS, this measure was required by code and therefore Enbridge Gas does not have the ability to realize these savings through DSM programs.

10. Further, specifically as it relates to the Low Income Single Family segment, even if the Amendment 15 changes were disregarded, Enbridge Gas would not support the position that upgrading fireplaces would be a feasible measure. Firstly, from an availability perspective, through its understanding of the low income market, it wouldn't expect that many fireplaces to be available for upgrade. Secondly, since the Home Winterproofing offering is a low / no cost offering, and the 2019 APS considered the installed cost of an upgrade case fireplace to be $3,900 against an estimated savings of ~186 m^3 annually, Enbridge Gas could not justify spending the ~$20 per m^3 when there were much more cost-effective opportunities available.

11. The 2019 APS stipulates that achievable savings potential are net of free riders, and that to determine gross budgets / savings requirements the utilities should use existing free ridership rates[5]. In the commercial sector, Demand Control Ventilation ("DCV") represents the second largest potential savings opportunity however it has a

---

[4] https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-regulations/forward-regulatory-plan-2019-2021/amendment-15-energy-efficiency-regulations/19384

[5] 2019 Integrated Ontario Electricity and Natural Gas Achievable Potential Study, Navigant (December 10, 2019), p. 116

free ridership rate currently assessed at 92%. Based on the 2019 APS forecasted net savings it would be a clear challenge to deliver the ~488 million annual gross m^3 over the 2022-2028 period in order to claim ~39 million annual net m^3 savings as outlined by the study. As an additional point of reference, the estimated total net savings that can be driven by the commercial market between 2022-2028 based on Enbridge Gas and PG's 2019 APS calculations is 420 million annual m^3.

12. Finally, at a high level when considering the different SCA sector potential savings levels versus required budgets for the 2022 year, the industrial sector was the least cost-effective of Enbridge Gas's current four sectors, with low income being the most cost effective. As with other discrepancies identified by Enbridge Gas and PG through their analysis, this does not align with the Company's experience in the Ontario DSM market.

13. One positive outcome in part driven from the 2019 APS is Enbridge Gas's Air Sealing Pilot and proposed stand-alone Professional Air Sealing measure in the Residential Single Measure offering (details can be found at Exhibit E, Tab 1, Schedule 2, page 17). The distinction that the 2019 APS made between the more Do-it-yourself ("DIY") versus Professional Air Sealing measure led the Company to explore this opportunity, and there may be a significant amount of opportunity to cost-effectively expand participation and increase savings.

14. As a result of its work with PG, and lessons learned referenced in PG's final report (Attachment 1) on the work completed to date, Enbridge Gas would like to highlight three recommendations the Company believes should be taken under consideration for future APS planning that may improve upon the 2019 APS development process to inform future DSM planning and program design.
    1. Utilities need to more centrally involved in the planning and execution of potential studies as, "studies led by the utility have historically resulted in

products that were most easily turned into program action." While Enbridge Gas was involved as part of the advisory group, it was challenging at times to be sure of which of its recommendations were being undertaken or how they were adopted into the study. (Attachment 1, page 2)

2. The approach to developing the APS needs to deliberately and consistently engage Enbridge Gas's internal and external stakeholders. While the 2019 APS did allow for significant engagement with utility staff at certain points in the process, Enbridge Gas believes that outputs and outcomes need to be more closely linked to local experience rather than extrapolated from the experience in other jurisdictions. Enbridge Gas recognizes that the 2019 APS development process was challenged by a number of utility staff moving in and out of the project as a direct result of the utility integration taking place at the time. This will clearly not be the case in future APS studies. (Attachment 1, page 2)
3. The targeted output from the APS should be "program potential' rather than traditional achievable potential. Posterity states, "Estimates of program potential should consider the context of past program performance (including net-to-gross factors from recent evaluations), ongoing program experience (including program design characteristics), best practices from other jurisdictions, and forecasted program budgets by sector and segment." (Attachment 1, page 3)

15. The 2019 APS has proven useful as a reference tool for a high-level comparison of targets, and it has provided some confidence in the relative weighting of Enbridge Gas's sector targets. Enbridge Gas and Posterity have worked together to improve the PG model so it can begin to represent real world market realities, through updates to measure characterization, measure adoption and sector definitions. Despite these best efforts, there remains a fundamental disconnect between the

theoretical achievable potential and costs represented in the model, and how DSM programs operate in the Ontario market.

POSTERITY GROUP

Demand Side Management Planning Support

Final Report Documenting Data Inputs, Assumptions and Method

Date: April 2021

Enbridge Gas Inc
500 Consumers Road
North York, ON M2J 1P8

Posterity Group
43 Eccles St, 2nd Floor – Unit 2
Ottawa, ON K1R 6S3

POSTERITY GROUP

Contents

1 Introduction

This document accompanies the Microsoft Excel and PowerBI output files and information Posterity Group (PG) has developed for Enbridge Gas Inc. (EGI) in support of its DSM planning activities from 2019 through 2021. It is a reference document that captures details on the adjustments PG has made to the 2019 Achievable Potential Study (APS) dataset, and why these adjustments are justified.

1.1 Scope of DSM Planning Support and Use of the APS

The intent of the 2019 APS was to "identify and quantify achievable potential energy savings (electricity and natural gas) and greenhouse gas (GHG) emissions reductions, and the costs associated with delivering this potential for the period of 2019-2038"[1]. The APS was also intended to "provide data and analysis to inform: the development of future conservation policy or frameworks; program design, implementation and evaluations; and long-term resource planning and system operations"[2].

The achievable potential estimated in studies such as the APS is materially different from program potential for the same measures. Various program design elements (such as upstream engagement versus direct install versus retail point-of-sale incentives) will change both the uptake and the cost-effectiveness of a measure from various perspectives. While a potential study may seek to bracket achievable potential by reviewing various programs in different jurisdictions, there is never enough budget to consider all program options for all measures.

As directed by EGI, our intention was to maintain and use as many APS data inputs and assumptions as possible to inform DSM planning, but to make adjustments to the APS dataset as appropriate.

To accomplish this objective, PG has worked with EGI to build an end-use model of its service territory using PG's Navigator™ Energy and Emissions Simulation Suite. We began by mirroring the model developed for the OEB for the 2019 APS. Many of the inputs for the mirrored model came directly from the APS, however in some cases, the consulting team needed to make estimates about underlying assumptions in order to match the APS results.

Using this mirrored model as a starting point, work to date has resulted in several adjustments to the APS dataset to better reflect EGI's knowledge and experience of the Ontario DSM market, EGI's current TRM assumptions, as well as known changes to appliance standards.

These adjustments can be grouped under four categories:

- Reference case structure and assumptions: The APS outputs included sector definitions, and segment classifications that were not consistent with EGI's definitions. Changes have been made to improve the reference case structure.
- Measure input assumptions: The APS included some input assumptions that were not substantiated, did not reflect known changes to legislated minimum performance standards,

[1] Navigant, 2019. "2019 Integrated Ontario Electricity and Natural Gas Achievable Potential Study". Prepared for the IESO and the OEB.

[2] ibid

or did not align with current TRM assumptions. These measure input assumptions have been updated to align with current assumptions and information.

- Achievable potential analysis: Measure diffusion assumptions in the APS were not clear based on the outputs available. Explicit measure diffusion assumptions have been integrated into the APS dataset.
- Budget assumptions and scenario options: The APS showed declining incentive and administrative cost assumptions over time for Scenario A, which is inconsistent with the experience of EGI. The APS dataset was also static and did not facilitate sensitivity analysis. Changes have been integrated into the APS dataset to address the declining cost challenge, and to enable sensitivity analysis.

Posterity continues to work with EGI to improve potential modelling outputs and incorporate as much useful information from the 2019 APS as possible into DSM program design and delivery plan. While the ability to leverage APS output data to inform future program targets remains limited due to the gap between achievable potential estimates and program potential, PG believes the gap has been narrowed thanks to the time invested by PG and EGI to engage with EGI internal program stakeholders more thoroughly.

1.2 Lessons Learned

PG's staff have decades of experience leading conservation potential studies in Ontario and across Canada. It is from this perspective that we understand the challenges associated with using output data from traditional conservation potential studies to plan and design conservation programs. There are a number of reasons why outputs are not always well suited to support program planning: potential studies are typically high-level studies that cannot focus on individual measures in great detail, measure analysis often does include significant local stakeholder engagement, and sometimes utilities are not sufficiently involved in the process.

PG staff have, in previous engagements, found it difficult to turn potential study results into program planning inputs, even when using the results of our own previous potential studies. This has caused PG to extensively rethink and redesign our conservation potential study processes. For future studies, we recommend that:

- EGI should be more directly involved in the planning and execution of the study. While care must be taken to ensure that the contractor retains impartiality and independence in developing potential estimates, we believe studies led by the utility have historically resulted in products that were most easily turned into program action. Utilities have a vast amount of customer data to inform the accuracy of the reference case and can assemble extensive program data from their own service territory. We believe the risks to impartiality can be mitigated by assembling a strong advisory group representing a range of views and mandating that the contractor be responsive to their input.
- The approach should be deliberately designed to engage EGI's internal and external stakeholders. We feel that meaningful and direct engagement of internal and external stakeholders is necessary for a potential study to serve a utility's needs. This specifically means engaging to undertake better measure research, to assess achievable/program participation, and to critique reporting and analysis.

- Program potential should be a specific output. Program design and delivery characteristics need to be applied to assess program potential in addition to traditional 'achievable' potential. Estimates of program potential should consider the context of past program performance (including net-to-gross factors from recent evaluations), ongoing program experience (including program design characteristics), best practices from other jurisdictions, and forecasted program budgets by sector and segment.

Acting on these lessons will result in a better return on ratepayer dollars through improved integration of utility reference case data and assumptions, better integration of Ontario-specific market knowledge, and study outputs that are designed to align more closely with DSM strategy and planning requirements.

2 Navigator End-Use Model for EGI

A model for the residential, multi-residential, low-income, commercial, industrial and large volume sectors was developed using Posterity Group's Navigator Energy and Emissions Simulation Suite. This section provides an overview of the model structure.

2.1 Sequence of Model Development

The model was developed in the following sequence for each sector:

1. Base Year (2017): Based on historical data. Base year data for consumption and number of accounts from the 2019 APS.
2. Reference Case (2018-2038): forecast of natural gas consumption from 2018 to 2038 based on exogenous conditions that follow a "business-as-usual" scenario. Account totals and energy intensities in the base year were adjusted to match the forecasted consumption growth. Data came from the 2019 APS.
3. DSM Scenario Analysis (2021-2038): technical potential, economic potential and multiple achievable potential forecasts that illustrate possible futures based on varying budget assumptions (and in the case of IRP analysis, varying economic screen assumptions and additional IRP measure definitions)

2.2 Model Parameters

Exhibit 1 defines the five parameters that provides the structure used for the model.

Exhibit 1 – EGI End-Use Model Parameters

Parameter	Definition
Accounts	Number of EGI customer accounts
Units	The basis for how energy consumption is expressed. Note that the unit of analysis is unique to each sector: dwellings in the residential sector, square feet of floor area in the commercial sector and the relative size of different rate class accounts in the industrial sector.

Parameter	Definition
Saturation	For most end uses, Saturation is the extent to which an end-use is present in a region and segment.
Fuel Share	The percentage of the energy end-use that is supplied by each fuel
Unit Energy Consumption (UEC)	The amount of energy used by each end-use per unit.

Once each parameter of the model is populated with the applicable data, energy consumption is calculated for a specific end use for each region, segment, and vintage each year using the following equation:

*Consumption = Units * Saturation * Fuel Share * Unit Energy Consumption*

The model is populated with inputs for each parameter, as explained in the following sections for each sector.

2.3 Key Data Sources

Key data sources common to all include:

- *2019 Ontario Achievable Potential Study (APS)*. The 2019 APS was used to disaggregate gas consumption by end-use, estimate fuel shares in the commercial and industrial sector.
- *Historic EGI Program Outcomes*. EGI provided information on measure cost, savings, and participation from past programs in all sectors. These data inputs were used to modify measure characteristics from the APS.

2.4 Model Structure

This subsection outlines coverage of the end-use model in terms of regions, sectors, segments, end uses, and vintages.

Regions

The end-use model disaggregates gas consumption into the following legacy service regions:

- Union-North
- Union-South
- EGD-GTA
- EGD-Niagara
- EGD-Ottawa

Consumption was also sorted into the 10 IESO region in Ontario, which can be used if needing to examine potential impacts to the electricity sector.

POSTERITY GROUP

Segments, End Uses & Vintages by Sector

The model covers six sectors: Residential, Multi-Residential, Low Income, Commercial, Industrial, and Large Volume. Each sector is unique and has important differences which are reflected in how inputs and outputs are organized.

Exhibit 2 presents the specific way each sector is organized in the end-use model, and how inputs and outputs for each sector are disaggregated.

POSTERITY GROUP

Exhibit 2 - Segments, End Uses & Vintages by Sector

	Residential	Low Income	Multi-Unit Residential	Commercial	Industrial	Large Volume
Segments	• Attached or Row House • Detached House	• Low-Income Multi-Family • Low-Income Single-Family	• Multi-Res High Rise • Multi-Res Low Rise	• Food Retail • Hospital • Large Hotel • Large Non-Food Retail • Large Office • Long Term Care • Other Commercial • Other Hotel/Motel • Other Non-Food Retail • Other Office • Restaurant • School • University/College • Warehouse	• Agriculture • Chemicals Manufacturing ("Mfg") • Fabricated Metals Mfg • Food and Beverage Mfg • Mining; Quarrying and Oil & Gas Extraction • Non-metallic Minerals Product Mfg • Other Industrial • Petroleum Mfg • Plastic and Rubber Mfg • Primary Metals Mfg • Pulp; Paper; and Wood Products Mfg • Transportation and Machinery Mfg • Water & Wastewater Treatment	• Food and Beverage Mfg • Primary Metals Mfg • Pulp; Paper; and Wood Products Mfg • Chemicals Mfg • Mining; Quarrying and Oil & Gas Extraction • Non-metallic Minerals Product Mfg • Plastic and Rubber Mfg • Transportation and Machinery Mfg • Petroleum Mfg

	Residential	Low Income	Multi-Unit Residential	Commercial	Industrial	Large Volume
End Uses	• Space Heating • Water Heating • Cooking • Misc Residential • Washing/Drying Appliances	• Space Heating • Water Heating • Cooking • Misc Residential • Washing/Drying Appliances	• Space Heating • Water Heating • Cooking • Misc Residential • Washing/Drying Appliances	• Cooking • Lighting • Space Heating • Water Heating • Misc Commercial • Refrigeration	• HVAC • Other Process • Process Cooling • Process Heating (Direct) • Process Heating (Water and Steam)	• HVAC • Other Process • Process Cooling • Process Heating (Direct) • Process Heating (Water and Steam)
Vintages	• Existing (Pre-2017) • New (Post-2017)	• Existing (Pre-2017) • New (Post-2017)	• Existing (Pre-2017) • New (Post-2017)	• Existing (Pre-2017) • New (Post-2017)	• N/A	• N/A

3 DSM Planning Adjustments

Work to date has resulted in several important adjustments to the APS dataset. These adjustments are presented under four subsections:

- Reference case structure and assumptions
- Measure input assumptions
- Achievable potential analysis
- Budget assumptions and scenario options

3.1 Reference Case Structure and Assumptions

3.1.1 Demolition Rate

Summary	A 2% rate of demolition was assumed for the Res, LI, MR, and Com sectors. Demolition assumptions get converted to annual replacements in the model (i.e., this adds to the annual NC rate). Demolition rates were likely assumed by the APS contractor, but these details were not published.
Details	Appendix A (EGI End-Use Model – DSM Assumption Tracker)

3.1.2 Sector Disaggregation

Summary	The APS segmented EGI's service territory into three primary sectors: Residential, Commercial, and Industrial. Multi-residential and Low-Income segments have been disaggregated from the Residential sector and are now stand-alone sectors in the model. This structure better reflects the way EGI categorized its customers and how it undertakes DSM planning. Large Volume Industrial was also disaggregated from Industrial. Because Large Volume customers have different characteristics EGI engages with this segment differently.
Details	Appendix B (Memo: Remapping the Industrial Sector)

3.1.3 Industrial and Large Volume Rate-Zone & Segment Remapping

Summary	The APS did not correctly map industrial energy by segment from the IESO zones to the five gas rate zones. Using data from EGI, annual volumes for the Industrial and Large Volume segments have been re-mapped to match segment classification more accurately to assumed end-used profiles, to capture distribution more accurately by rate-zone, and to fix issues with assumed growth rates in the reference case for the agriculture sector.
Details	Appendix B (Memo: Remapping the Industrial Sector) Appendix C (Memo: Adjusting Industrial Account Mapping to Resolve Exaggerated HVAC Consumption)

3.2 Measure Input Assumptions

Several measure-related adjustments have been made. These adjustments are presented under four categories:

3.2.1 Removing measures with savings and cost assumptions that are not substantiated

Summary	Two notable measures were removed because they were taking up a disproportionate share of the incentive costs under Scenario A, effectively limiting Scenario A potential. The Residential Home Energy Reports measures has been removed. It accounts for approximately 2% of the 2038 residential savings potential for Scenario A. In contrast, it accounts for approximately 74% of the incentive spending in 2038 ($14 million out of $19 million in residential incentive spending) The Commercial Education Capacity Building measures has been removed. It accounts for approximately 1% of the 2038 commercial savings potential for Scenario A. In contrast, it accounts for approximately 44% of the incentive spending in 2038 ($9 million out of $21 million in commercial incentive spending)
Details	Appendix A (EGI End-Use Model – DSM Assumption Tracker) Appendix D (Memo: Falling Program Costs)

3.2.2 Removing measures that are not applicable

Summary	Several measures have been removed because they are not applicable within specific sectors and segments. For example, pool cover measures for low-income housing (housing which does not typically have pools), and clothes drying racks which do not save energy in Canadian climates.
Details	Appendix A (EGI End-Use Model – DSM Assumption Tracker)

3.2.3 Updating measures to reflect known changes to performance standards

Summary	Several measures have been updated to reflect known changes to legislated minimum performance standards. For example, Amendment 15 to the Federal Energy Efficiency Regulations which impacts boilers, fireplaces, and furnaces, limits potential savings by increasing code-mandated equipment efficiency.
Details	Appendix A (EGI End-Use Model – DSM Assumption Tracker)

3.2.4 Adjusting input assumption to reflect EGI historic experience and current TRM assumptions

Summary	Several measures have been updated to reflect savings and incremental cost assumptions that align with current TRM assumptions and EGI experience. For example, Residential envelope measures like air sealing, attic, basement and wall insulation were significantly misaligned with Enbridge's historic verified savings (and when combined together, savings significantly exceeded the average dwelling's unit energy consumption for space heating). A whole home building envelope measure was added to better align with Enbridge's programs.
Details	Appendix A (EGI End-Use Model – DSM Assumption Tracker)

3.3 Achievable Potential Analysis

Summary	The APS measure adoption and diffusion assumptions do not align with EGI's historic market experience. In some cases, there is a lack of transparency about how these assumptions are applied (e.g., the APS payback curve assumptions are clear, but diffusion curve assumptions and method are not well understood). EGI has decided to depart from the APS measure adoption assumptions. Theoretical achievable potential estimates have been revised using transparent payback and diffusion curve assumptions and a well-documented method.
Details	Appendix E (Theoretical Achievable Potential Analysis – Method Notes)

3.4 Budget Assumptions and Scenario Options

3.4.1 Declining incentive assumption

Summary	Under Scenario A, the APS assumes declining incentive and administrative costs over time for many measures. When the declining program costs are disabled, the program spending increases nearly 50% by the end of the study period across all sectors. If administrative costs were included, assuming they are approximately 40% of incentive costs, the total spending by 2038 would exceed $110 million net per year. This assumption does not align with EGI's historic experience. $/CCM has not historically declined over time. Declining costs have been disabled so that program spending more accurately reflect EGI's $/CMM benchmarks.
Details	Appendix D (Memo: Falling Program Costs)

3.4.2 Budget Scenario Options

Summary	EGI needs to explore budgets scenarios that differ from the APS Scenarios A, B, and C because none of these scenarios align with the notional annual sector budgets in the 2021 plan submission. To enable sensitivity analysis to support the 2021 DSM plan submission, EGI needs to understand how moderate budget increases or decreases (compared to a 2022 'business as usual' scenario) could impact savings on a sector-by-sector basis. EGI also needed flexibility to adjust sector budget allocation to align with ratios that more closely resembled historic annual budgets. To support this requirement, a 'menu' of achievable potential options was developed for each measure, within each sector, by varying '% incremental incentive' assumptions. Achievable potential savings, units affected, associated budget and % of total economic potential were modelled for 10, 20, 30, 40, 60, 80, and 100 percent incremental incentive options.
Details	Appendix E (Theoretical Achievable Potential Analysis – Method Notes)

Appendix A EGI End-Use Model – DSM Assumption Tracker

1 DSM Model Assumption Tracker

This appendix describes key assumptions in PG's DSM model. For each of the sectors in the model, a list of changes to reference case assumptions are DSM measure inputs are provided.

1.1 Applicable to More than One Sector

[Category] *Key Model Input*	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[Reference Case Structure & Assumptions] *Demolition Rate*	• Demolition assumptions get converted to annual replacements in the model. i.e, this adds to the annual NC rate. • No demolition assumptions were provided in the APS data or the report.	• For Res and Com: Incorporated a 2% rate of demolition and replacement • For Ind: No demolition assumed.	• n/a	• For Res and Com: NC savings did not align with known new build forecasts. By adding in replacement numbers due to demolition, the NC savings appear to be reasonable. • It is likely the APS implicitly assumed this.

1.2 Residential Sector

1.2.1 Residential

[Category] *Key Model Input*	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[Measure not Substantiated] **Residential Home Energy Report Measure**	• Scenario A residential potential is being limited by the inclusion of this measure because the measure takes up a disproportionate share of the incentive costs.	• Measure disabled in the model	• n/a	• The Home Energy Reports measure accounts for approximately 2% of the 2038 residential savings potential for Scenario A. In contrast, it accounts for approximately 74% of the incentive spending in 2038 ($14 million out of $19 million in residential incentive spending)
[Changes to Performance Stds] **Residential Fireplace Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 15): SOR/2019-164	• Not applicable because of Amendment 15

POSTERITY GROUP

[EGI Historic Experience/TRM Assumptions] **Adaptive Thermostat Measure**	• Updated input assumptions to reflect EGI historic program data	• Incremental costs for new and retrofit updated to $250 and $300, respectively. • Adjusted natural gas savings to be 105 and 173 m3/household for new construction and retrofit respectively. • Added thermostat electricity savings for inclusion in the TRC calculation	• EGI Historic Program Data, OEB TRM v. 4	• APS measure savings exceeded those in the OEB TRM and EGI's historic programs
[EGI Historic Experience/TRM Assumptions] **Air Sealing Measure**	• Updated input assumptions to reflect EGI historic program data	• Adjusted natural gas savings to be 315 m3/household, in line with EGI's HER program experience. • Added electricity savings for inclusion in the TRC calculation.	• EGI Historic Program Data	• APS measure savings exceeded EGI's historic measured savings from the HER program

POSTERITY GROUP

[EGI Historic Experience/TRM Assumptions] **Basement Wall Insulation Measure**	• Updated input assumptions to reflect EGI historic program data	• Set measure lifetime to 30 years. • Adjusted natural gas savings to be 304 m3/household, in line with EGI's HER program experience. • Added electricity savings for inclusion in the TRC calculation	• EGI Historic Program Data	• APS measure savings exceeded EGI's historic measured savings from the HER program
[EGI Historic Experience/TRM Assumptions] **Attic Insulation Measure**	• Updated input assumptions to reflect EGI historic program data	• Adjusted natural gas savings to be 296 m3/household, in line with EGI's HER program experience. • Added electricity savings for inclusion in the TRC calculation	• EGI Historic Program Data	• APS measure savings exceeded EGI's historic measured savings from the HER program
[EGI Historic Experience/TRM Assumptions]	• Updated input assumptions to reflect	• Adjusted natural gas savings to be 218 m3/household, in	• EGI Historic Program Data	• APS measure savings exceeded EGI's historic measured

Floor Insulation Measure	EGI historic program data	line with EGI's HER program experience.		savings from the HER program
[EGI Historic Experience/TRM Assumptions] **Wall Insulation Measure**	• Updated input assumptions to reflect EGI historic program data	• Adjusted natural gas savings to be 488 m3/household, in line with EGI's HER program experience. • Added electricity savings for inclusion in the TRC calculation	• EGI Historic Program Data	• APS measure savings exceeded EGI's historic measured savings from the HER program
[EGI Historic Experience/TRM Assumptions] **High Efficiency Condensing Furnace Measure**	• Updated input assumptions to reflect EGI historic program data	• Adjusted savings to be 17 m3/year and 25 m3/year for new construction and replace-on-burnout applications respectively. • Adjusted incremental cost to be equal to that of the low-income SF measure.	• OEB TRM v4	• APS measure savings exceeded savings in the OEB TRM

POSTERITY GROUP

[Measure Missing from APS] **Heat Recovery Ventilator – 0% Sensible Effectiveness Baseline**	• Added measure not included in the APS • This is the case where no prior ERV/HRV is present	• Created measure not included in the APS. • Natural gas savings set to 308 m3/year. • EUL set to 14. • Incremental cost set to $610.	• OEB TRM v4	• Measure excluded from APS.
[Measure Missing from APS] **Heat Recovery Ventilator – 55% Sensible Effectiveness Baseline**	• Added measure not included in the APS • This is the case where an existing ERV/HRV is being upgraded to higher efficiency	• Created measure not included in the APS. • Natural gas savings set to 93 m3/year. • EUL set to 14. • Incremental cost set to $128.	• OEB TRM v4	• Measure excluded from APS.
[Measure Missing from APS] **NEW Construction - Heat Recovery Ventilator**	• Measure included in APS with incorrect baseline.	• Updated savings, cost, and lifetime to reflect savings from a 55% SE baseline. • Natural gas savings set to 93 m3/year.	• OEB TRM v4	• APS measure savings exceeded savings in the OEB TRM

POSTERITY GROUP

		• EUL set to 14. • Incremental cost set to $128.		
[Measure Missing from APS] **Heat Recovery Ventilator – No Mech. Ventilation Baseline**	• Added measure not included in the APS • This is the case when customer do not have mechanical ventilation and EGI proposes to add with Heat Recovery	• Created measure not included in the APS. • Natural gas savings set to 164 m3/year. • EUL set to 14. • Incremental cost set to $2,000.	• OEB TRM v4	• Measure excluded from APS • 90% of units from EGI's program experience fall under this baseline
[EGI Historic Experience/TRM Assumptions] **Whole Home – Building Envelope Measure**	• Added new measures: Whole Home-Building Envelope (RET) • EGI currently has a Whole Home custom program which achieves savings from a combination of individual measures (air sealing, attic insulation, basement insulation, and wall insulation)	• Lifetime per EGI value: 30 • Cost assumption from EGI average incentive payment in 2019: $1,800 • Savings calibrated to EGI value (m3): 447	• EGI historic program data (2017, 2018, 2019)	• Adding this measure to more accurately reflect how EGI runs its program

[EGI Historic Experience/TRM Assumptions] **Residential Comprehensive Draft Proofing Measure**	• Air Sealing measure has been updated to reflect EGI historic program data • This measure now double counts Air Sealing savings because it is a subset of those savings	• Measure disabled in the model	• n/a	• Disabled to avoid double counting savings.
[EGI Historic Experience/TRM Assumptions] **Residential Basement or Crawlspace Insulation**	• Basement Wall Insulation measure has been updated to reflect EGI historic program data • This measure now double counts Basement Wall Insulation savings because it is a subset of those savings	• Measure disabled in the model	• n/a	• Disabled to avoid double counting savings.
[Measure not Applicable] **Clothes Drying Racks Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Savings unlikely to materialize for indoor racks in Canadian climate
[Measure not Applicable]	• Incorrectly contributing to savings potential and	• Measure disabled in the model	• n/a	• Negligible savings from ducts within conditioned space

Duct Insulation Measure	program costs in the APS.			
[Changes to Performance Stds] **HE Furnaces in NC Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 15): SOR/2019-164	• Not applicable starting in 2025 because of Amendment 15
[Measure not Substantiated] **Minimize Hot and Warm Wash Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Behavioural measure; difficult to rely/confirm savings
[Measure not Applicable] **Water Heater Temperature Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Health risks associated with changes to DHW temperature
[Measure not Applicable] Energy Star Clothes Washers Measure	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Applicable to electric, not natural gas

1.2.2 Low Income

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[EGI Historic Experience/TRM Assumptions] **Adaptive Thermostat Measure**	• Updated input assumptions to reflect EGI historic program data	• Changed cost to EGI value: $410 • Calibrated savings/dwelling to EGI value 173 m3/year per household. • Added electricity savings for inclusion in the TRC calculation. • Set applicability to zero in low-income multi-family residential.	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential • Turned off in LI MF sector due to past inability to accurately quantify savings
[EGI Historic Experience/TRM Assumptions] **Whole Home – Building Envelope Measure**	• Added new measures: Whole Home-Building Envelope (RET); Whole Home-Building Envelope Indigenous (RET) • EGI currently has a Whole Home custom program which achieves savings from a combination of individual measures (air	• Lifetime per EGI value: 30 • Cost assumption was updated to reflect historic payments under EGI's HER program, $1,800 per house • Savings calibrated to EGI value (m3): 903 (LI); 674 (Indig) • Applicability split between LI and	• EGI historic program data (2017, 2018, 2019)	• Adding this measure to more accurately reflect how EGI runs its program

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
	sealing, attic insulation, basement insulation, and wall insulation)	indigenous: 99% LI; 1% Indig		
[EGI Historic Experience/TRM Assumptions] **Air Sealing Measure**	• Updated input assumptions to reflect EGI historic program data	• Lifetime increased to EGI value: 25 • Calibrated savings/dwelling to EGI value: 399 m3/year per house	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential
[EGI Historic Experience/TRM Assumptions] **Attic Insulation Measure**	• Updated input assumptions to reflect EGI historic program data • Added new measure: Indigenous (RET)	• Lifetime decreased to EGI value: 25 • Calibrated savings/dwelling to EGI values: 509 m3/year/house (LI); 286 m3/year/house (Indig) • Updated applicability for LI SF Indig based on EGI potential estimate • Scaled applicability for LI SF to account for potential associated with LI SF Indig: scaling factor of 0.97	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[EGI Historic Experience/TRM Assumptions] **Basement Wall Insulation Measure**	• Updated input assumptions to reflect EGI historic program data • Added new measure: Indigenous (RET)	• Calibrated savings/dwelling to EGI values: 681 m3/house (LI); 762 m3/house (Indig) • Updated applicability for LI SF Indig based on EGI potential estimate • Scaled applicability for LI SF to account for potential associated with LI SF Indig: scaling factor of 0.97	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential
[EGI Historic Experience/TRM Assumptions] **Wall Insulation Measure**	• Updated input assumptions to reflect EGI historic program data	• Calibrated savings/dwelling to EGI value: 831 m3/house • Set applicability to zero for low-income multi-family segment as per EGI experience	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential
[EGI Historic Experience/TRM Assumptions] **Floor Insulation Measure**	• Updated input assumptions to reflect EGI historic program data	• Calibrated savings/dwelling to match the non-LI residential measure savings of 11% per house, much lower than the percent savings in	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
		the APS measure description.		
[EGI Historic Experience/TRM Assumptions] **High Efficiency Condensing Furnace (ROB) Measure**	• Updated input assumptions to reflect EGI historic program data	• Calibrated savings/dwelling to EGI value: 25 m3/house • Updated incremental cost for ROB measure to $118.	• OEB TRM v4	• APS Saving figures inconsistent with OEB TRM
[EGI Historic Experience/TRM Assumptions] **Showerhead Measure**	• Added new measures: Showerhead (RET), Showerhead Indigenous (RET)	• Lifetime per EGI value: 10 • Cost per PG measure database: $19 (base is $12) • Savings calibrated to EGI value (m3): 28 • Applicability split between LI and indigenous: 92% LI; 8% Indig	• EGI historic program data (2017, 2018, 2019) • Posterity Group measure database	• Adding this measure to more accurately reflect how EGI runs its program
[EGI Historic Experience/TRM Assumptions] **Faucet Aerator Measure**	• Added new measures: Aerator (RET), Aerator Indigenous (RET) – 1.0 GPM	• Lifetime per EGI value: 10 • Cost per EGI value: $0.87 • Savings calibrated to EGI value (m3): 13	• EGI historic program data (2017, 2018, 2019)	• Adding this measure to more accurately reflect how EGI runs its program

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
		• Applicability split between LI and indigenous: 94% LI; 6% Indig		
[EGI Historic Experience/TRM Assumptions] **Comprehensive Draft Proofing/Air Sealing**	• Updated input assumptions to reflect EGI historic program data	• Name changed to Res | Air Sealing | Low MR | RET • Adjusted savings to match EGI's historic program experience of 162m3/unit	• EGI historic program data	• EGI's experience indicates lower savings potential
[EGI Historic Experience/TRM Assumptions] **Condensing Boiler**	• Updated input assumptions to reflect EGI historic program data	• Savings scaled down by 61%, the difference in savings between moving from a 76% vs a 84% efficient boiler to a 90% efficient boiler. 90% chosen due to measure specification of ">90% AFUE).	• EGI historic program data	• The APS used a 76% efficient baseline but code requires an 84% baseline
[EGI Historic Experience/TRM Assumptions] **Condensing Storage Water Heater**	• Updated input assumptions to reflect EGI historic program data	• Savings scaled down by 49%, the difference in savings between moving from a 76% vs an 84% efficient boiler to a 94.5% efficient water	• EGI historic program data	• The APS used a 76% efficient baseline but code requires an 84% baseline

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
		heat. 94.5% specified in the description.		
[EGI Historic Experience/TRM Assumptions] **Condensing Make Up Air Unit**	• Updated input assumptions to reflect EGI historic program data	• Savings adjusted to align with EGI's historic program savings of 13,960 m3 per MUA • Electricity savings added for inclusion in the TRC calculation	• EGI historic program data	• EGI's experience differs from APS savings estimate
[EGI Historic Experience/TRM Assumptions] **Retrofit Heat Recover Ventilator 0% Baseline**	• Added new measure that was not included in the APS	• Created a new measure for a generic capacity 100 CFM system using EGI's per-CFM cost and savings numbers. • Per CFM cost set at $1.61 • Per CFM savings set at 2.61 m3.	• EGI historic program data	• Measure excluded from APS
[EGI Historic Experience/TRM Assumptions] **New Construction Heat Recovery Ventilator**	• Updated input assumptions to reflect EGI historic program data	• Cost and savings adjusted on the basis of HRV cubic feet per minute capacity. • Per CFM cost set to $2 • Per CFM savings set to 0.74 m3	• OEB TRM v4	• APS used incorrect baseline, HRV is mandated by code thus baseline should be 55% SE

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[Measure not Applicable] **Clothes Drying Racks Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Savings unlikely to materialize for indoor racks in Canadian climate
[Measure not Applicable] **Duct Insulation Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Negligible savings from ducts within conditioned space
[Changes to Performance Stds] **HE Furnaces in NC Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 15): SOR/2019-164	• Not applicable starting in 2025 because of Amendment 15
[Measure not Substantiated] **Minimize Hot and Warm Wash Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Behavioural measure; difficult to rely/confirm savings
[Measure not Applicable]	• Incorrectly contributing to savings potential and	• Measure disabled in the model	• n/a	• Health risks associated with changes to

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
Water Heater Temperature Measure	program costs in the APS.			DHW temperature
[Measure not Applicable] Energy Star Clothes Washers Measure	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Applicable to electric, not natural gas
Pool Cover Measure	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Pool is typically not an applicable end-use in the low-income sector

1.2.3 Multi-Res

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[EGI Historic Experience/TRM Assumptions] **Adaptive Thermostat Measure**	• Updated input assumptions to reflect EGI historic program data	• Calibrated savings/dwelling to EGI value 63 m3/year per household in new construction • Calibrated savings/dwelling to EGI value 63 m3/year per household in retrofit	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
		• Added electricity savings for inclusion in the TRC calculation.		
[EGI Historic Experience/TRM Assumptions] **Demand Control Ventilation Measure**	• Updated input assumptions to reflect EGI historic program data	• Calibrated savings/dwelling to EGI value 636 m3/year per unit.	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential
[EGI Historic Experience/TRM Assumptions] **Building Recommissioning, Operations and Maintenance (O&M) Improvements Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Applicability set to zero.	• Analysis of APS Measure Inputs	• APS measure definition was vague and likely double-counted savings that should be attributed to adaptive thermostats, building automation, or demand control ventilation. • The very low cost of this measure ($26/dwelling) was causing it to displace the measures to which the savings should be attributed

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
				(thermostat, building automation, and DCV)
[EGI Historic Experience/TRM Assumptions] **Condensing Make Up Air Unit Measure**	• Updated input assumptions to reflect EGI historic program data	• Changed cost to EGI value: $4,229 • Calibrated savings/MUA to be 7,744 m3 • Added electricity savings for inclusion in the TRC calculation.	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates lower savings potential
[EGI Historic Experience/TRM Assumptions] **Condensing Boiler Measure**	• Updated input assumptions to reflect appropriate baseline efficiency	• savings scaled down by 61%, the difference in savings between moving from a 76% vs a 84% efficient boiler to a 90% efficient boiler. 90% chosen due to measure specification of ">90% AFUE). • Reduced boiler costs by 30% to reflect more efficient baseline	• EGI data	• APS used incorrect baseline efficiency, required updating to reflect code requirements
[EGI Historic Experience/TRM Assumptions]	• Updated input assumptions to reflect appropriate	• Savings scaled down by 49%, the difference in savings between moving from a 76% vs an 84% efficient boiler to a 94.5%	• EGI data	• APS used incorrect baseline efficiency, required updating to reflect code requirements

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
Condensing Storage Water Heater Measure	baseline efficiency	efficient water heat. 94.5% specified in the description Set applicability to zero in low-rise		

1.3 Commercial Sector

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[Incompatible Data Inputs] **Post-Upgrade Consumption for 349 Commercial Measures**	• The post-measure consumption for roughly half of the commercial APS measures was changed because the APS had post-measure consumptions of zero or negative numbers.	• Aside from measure adjustments described below, absolute measure savings were not changed. • Measures' percent savings were adjusted using PG's internal measure library.	• Posterity Group energy efficiency measure library.	• Of the 744 unique commercial-sector measures in the APS, 349 describe a post-measure consumption of zero or a negative number. When applied in PG's end-use model, these measures saved more energy than intended due to differing model structure. • Accurate representations of post-measure

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
				consumption were required. • Aside from measure changes described below, absolute measure savings were not changed (only % savings), thus the TRC outputs remain the same.
[Measure not Substantiated] **Commercial Education Capacity Building Measure**	• Scenario A commercial potential is being limited by the inclusion of this measure because the measure takes up a disproportionate share of the incentive costs.	• Measure disabled in the model	• n/a	• The Education and Capacity Building measure accounts for approximately 1% of the 2038 commercial savings potential for Scenario A. In contrast, it accounts for approximately 44% of the incentive spending in 2038 ($9 million out of $21 million in commercial incentive spending)
[Changes to Performance Stds] **Commercial Boiler Measure**	• Over contributes to savings potential in the APS through 2024.	• Measure input assumptions modified in the model:	• Regulations Amending the Energy Efficiency Regulations,	• APS boiler baseline efficiency was deemed to be incorrect (2019-2024) per EGI's

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
	• Incorrectly contributes to savings potential and program costs beyond 2024.	• From 2019- 2024, Baseline efficiency changed to 84% (the APS assumed 76%) • The ending applicability year has been changed to 2024 (the APS assumed applicability throughout the reference period)	2016 (Amendment 15): SOR/2019-164	understanding of its service territory • Not applicable starting in 2025 per Amendment 15
[EGI Historic Experience/TRM Assumptions] **Boilers – Advanced Controls (Steam Systems) Measure**	• Updated input assumptions to reflect EGI historic program data	• Applicability set to zero for all NC and for certain segments specified by EGI • Updated participation so that average annual program savings to 2025 equal the estimated annual EGI potential estimate.	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates different savings potential; changes vary depending on segment.

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[EGI Historic Experience/TRM Assumptions] Adaptive Thermostats Measure	• Updated input assumptions to reflect EGI historic program data	• Applicability set to zero for all NC and for certain segments specified by EGI • Incremental cost updated to: $300 • Saving per unit updated	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates different savings potential; changes vary depending on segment.
[EGI Historic Experience/TRM Assumptions] Demand Control Ventilation Measure	• Updated input assumptions to reflect EGI historic program data	• Applicability set to zero for all NC and for certain segments specified by EGI • Incremental cost updated to: $1,050 for RET and $750 for NC • Saving per unit updated	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates different savings potential; changes vary depending on segment.
[EGI Historic Experience/TRM Assumptions] Building Recommissioning, O&M	• Updated input assumptions to reflect EGI historic program data	• Applicability set to zero for all NC and for certain segments specified by EGI	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates different savings potential; changes vary depending on segment.

Key Model Input Improvements Measure	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[Measure not Applicable] **Air Handler with Dedicated Outdoor Air Systems Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Electric savings measure; any associated gas savings are the result of savings from other measures (e.g., DCV)
[Measure not Substantiated] **Advanced BAS/Controllers Measure**	• Incorrectly contributing to savings potential and program costs in the APS.	• Measure disabled in the model	• n/a	• Measure scope in the APS is unclear and unsupported; EGI does not have confidence in savings estimates
[EGI Historic Experience/TRM Assumptions] **Condensing Make Up Air Unit Measure**	• Updated input assumptions to reflect EGI historic program data	• Applicability set to zero for all NC and for certain segments specified by EGI • Incremental cost updated • Saving per unit updated	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates different savings potential; changes vary depending on segment.
[EGI Historic Experience/TRM Assumptions] **Destratification Measure**	• Updated input assumptions to reflect EGI historic program data	• Incremental cost updated to: $7,961	• EGI historic program data (2017, 2018, 2019)	• EGI's experience indicates different savings potential; only

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
		• Saving per unit updated		warehouses have potential

1.4 Industrial Sector

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
[EGI Historic Experience/TRM Assumptions] **Industrial Boiler Upgrade Measure – Agriculture Segment**	• Measure site energy saving assumptions in APS exceed EGI program experience • Participation rate assumption in APS exceed EGI program experience	• Measure input assumptions modified in the model: • Measure savings scaled down by a factor of 0.57 to calibrate to EGI program experience.	• EGI historic program data (2017, 2018, 2019)	• Based on interpretation of the APS measure assumptions, the boiler upgrade measure appears to save approximately 4.7% of site energy in agriculture. This is higher than 2.7% more typically found in EGI program applications.
[EGI Historic Experience/TRM Assumptions] **Industrial Recommissioning Measure – Agriculture Segment**	• Measure site energy saving assumptions in APS exceed EGI program experience • Participation rate assumption in APS	• Measure input assumptions modified in the model: • Measure savings scaled down by a factor of 0.1 to calibrate to EGI	• EGI historic program data (2017, 2018, 2019)	• Based on interpretation of the APS measure assumptions, the recommissioning measure appears to save 40% of site energy in

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
	are lower than EGI program experience	program experience.		agriculture. This is higher than the 4.1% found in EGI program applications
[EGI Historic Experience/TRM Assumptions] **Industrial Greenhouse Envelope Improvement Measure – Agriculture Segment**	• Measure site energy saving assumptions in APS exceed EGI program experience • Participation rate assumption in APS are lower than EGI program experience	• Measure savings scaled down by a factor of 0.17 to calibrate to EGI program experience.	• EGI historic program data (2017, 2018, 2019)	• Based on interpretation of the APS measure assumptions, the envelope improvement measure appears to save 30% of site energy in agriculture. This is higher than the 5.2% found in EGI program applications
[Industrial and Large Volume Rate-Zone & Segment Remapping] **NC Growth Rate – Agriculture Segment**	• The estimated growth in the Agriculture segment appears to be too small in the APS reference case	• EGI's growth forecast for the Agriculture segment is 25,500,000 m3/year (170 acres/year to 2026, at an average annual	• EGI Agriculture Sector Growth Forecast	• New build agriculture accounted for 50% of the EGI program savings, on average, over the three program years 2017, 2018, and 2019, but this potential is

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
	• This results in NC savings being underreported	consumption per acre of 150,000 m3) • Distributed the added volume to the agriculture segment in each region of the province in proportion to the base year agriculture volumes in each region, so agriculture is growing at the same rate throughout the province.		greatly underestimated in the APS. • Prior to adjusting the growth rate, nearly 85% of the savings in agriculture segment in Scenario A are from existing facilities.
[EGI Historic Experience/TRM Assumptions] **Industrial Steam Trap Measure**	• APS measure did not pass economic screen • EGI customers have been implementing this measure via DSM programs for the last several years; potential underrepresented	• Measure input assumptions modified in the model: • Incremental cost scaled down by 50%	• EGI historic program data (2017, 2018, 2019)	• EGI program experience shows this measure passes TRC and should be included in program potential estimate.

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
	without this measure			
[EGI Historic Experience/TRM Assumptions] **Industrial Dock Seal Measure**	• APS measure did not pass economic screen • EGI customers have been implementing this measure via DSM programs for the last several years; potential underrepresented without this measure	• Measure input assumptions modified in the model: • Incremental cost scaled down by 30%	• EGI historic program data (2017, 2018, 2019)	• EGI program experience shows this measure passes TRC and should be included in program potential estimate.
[Industrial and Large Volume Rate-Zone & Segment Remapping] **Industrial sector reference case consumption**	• Reference case consumption was incorrectly mapped from IESO zone to the five EGI gas regions • APS included LV and other industrial customers under one sector; EGI treats these two customer groups very differently for DSM	• See Memo dated 18 Aug 2020	• Table of postal codes by IESO zone • Table of postal codes by EGI region • Table of 2017 industrial consumption by industrial sub-sector and postal code, and presented by rate class to	• EGI can now understand DSM impacts accurately at a regional level. • EGI can now look at LV customers separate from standard industrial customers and treat these two customer groups differently with respect to DSM planning

POSTERITY GROUP

Key Model Input	Variable & Impact	Assumptions/Actions	Sources (if applicable)	Justification
			enable identification of LV consumption	
[Industrial and Large Volume Rate-Zone & Segment Remapping] **Industrial sector reference case consumption**	• Reference case consumption was incorrectly mapped between the refinery and plastics and rubber sector, which exaggerated HVAC consumption by ~400 million m3	• See Memo dated 18 December 2020	• Table of postal codes by IESO zone • Table of postal codes by EGI region • Table of 2017 and 2019 industrial consumption by industrial sub-sector and postal code, and presented by rate class	• The consumption of two major industrial sectors was too high/low by roughly 1 billion m3/year • Correcting sectoral classification of refineries resulted in a more accurate representation of potential for HVAC and process-related measures.

Appendix B Memo: Remapping the Industrial Sector

This memo is intended to report back on the process of remapping the industrial sector in the end-use model we have been building to support EGI with DSM planning and IRP.

Data

Enbridge supplied three datasets:

- a table of postal codes by IESO zone
- a table of postal codes by Enbridge region
- a table of 2017 industrial consumption by industrial sub-sector and postal code

We combined these three tables into one workbook and built a table combining the consumption, sub-sector, zone, and region. We had to do a small amount of data cleaning:

- 161 postal codes in the consumption table were not present in the Enbridge postal codes by region table. In most cases the missing postal codes were in the same 3-digit FSA, so we sorted the table in order of postal code and then wrote a macro to add in the 161 missing rows, copy the location and region data from the row immediately above each one, and highlight them in yellow so we could review each one to make sure the location and region made sense.
- 3 postal codes fell in an IESO zone called TORONTO, SOUTHWEST in the table. Clearly, these postal codes are on the border between the two zones, but the end-use model we are building for EGI is not structured to accommodate a separate category for postal codes that span the border between two zones, so we had to place consumption for these postal codes in one or the other. We studied the map carefully for each of these codes to place two of them in SOUTHWEST and the other in TORONTO. In each case it was a matter of which side of a street the specific postal code referred to, and the FSA included both sides of the street, so the full 6-digit postal was required to correctly place the customers and their consumption.
- We can provide a report on which postal codes were “cleaned” in these two steps, if Enbridge would like to review what we did.

Mapping

We used the map to develop a replacement table for the mapping table used in the APS model. For each industrial sector, this mapping table assigns a percentage of the consumption in each IESO zone to one of five Enbridge service regions (EGD GTA, EGD OTTAWA, EGD NIAGARA, UNION NORTH, and UNION SOUTH). There are several assumptions inherent in this:

- We originally assumed we could retain the original APS division of industrial consumption among the IESO zones, because we assumed the IESO accurately divided industrial section consumption across their geographic zones. However, we found it did not carry over to a correct mapping of industrial gas consumption by zone. The following table shows the comparison between the original APS breakdown by zone, the breakdown in the current PG model, and the raw breakdown from the mapping (the latter two are the same because we have updated the model to reflect this recent re-mapping exercise):

IESO Zone	Bruce	East	Essa	Niagara	Northeast	Northwest	Ottawa	Southwest	Toronto	West
Percentage per APS	0.0%	6.0%	2.2%	1.8%	4.8%	2.4%	0.6%	48.8%	10.4%	22.9%
Percentage in Current Model	0.0%	5.8%	2.6%	3.0%	9.1%	1.7%	1.1%	24.2%	16.6%	36.0%
Raw Percentage in New Mapping	0.0%	5.8%	2.6%	3.0%	9.1%	1.7%	1.1%	24.1%	16.6%	36.0%

- We mapped Enbridge's ASPHALT AND CEMENT, CEMENT/ASPHALT, and MINERAL sub-sectors to the Non-metallic Minerals Product Mfg APS segment. We could rename the APS segment to match one of Enbridge's sub-sector names, but it would be significantly more work to split this APS segment into three.
- We mapped Enbridge's CONSUMERS GOODS AND NON-METALLIC MANUFACTURING, HEAVY MANUFACTURING, LIGHT MANUFACTURING, OTHER INDUSTRIAL, and TEXTILE AND APPAREL sub-sectors to the Other Industrial APS segment. As above, it would be a significant amount of work to split this APS segment into five.
- We mapped both the Petroleum Mfg and the Plastic and Rubber Mfg segments in the APS according to the PETROLEUM REFINING Enbridge sub-sector mapping. We divided the demand between the two based on the ratio from the APS. If it is preferable to recombine them, we can do so by changing the names used for them in the output. (Navigator will still run them separately, but in the output they will look like they are part of the same segment.)
- We have mapped the APS segment Water & Wastewater Treatment based on the Enbridge UTILITY sub-sector. We are not sure what is in the Enbridge UTILITY sub-sector, but we suspect it is something else. If we should map this based on something else (such as distribution of the residential sector), we would appreciate a discussion on that.
- The overall mapping of the industrial sector based on this process now looks like this:

Enbridge Service Region	EGD-GTA	EGD-Niagara	EGD-Ottawa	Union-North	Union-South
Percentage per APS	19.1%	1.7%	3.1%	11.8%	64.3%
Percentage in Current Model	23.3%	2.5%	2.0%	14.9%	57.3%
Raw Percentage in New Mapping	23.3%	2.5%	2.0%	15.0%	57.2%

Large Volume

The large volume customers are in rate classes 100 and T2. We filtered the 2017 industrial consumption data to produce a pivot table of industrial consumption in these two rate classes by industrial sub-sector, IESO zone, and Enbridge region. We then followed these steps:

- We made a second copy of the industrial sector model files and changed the name of the sector to Large Volume.
- In the Large Volume model, we used the table of consumption by industrial sector, IESO zone, and region to scale the consumption in the base year so that only Large Volume customers are reflected.

- In the original Industrial model, we scaled the consumption so that it would reflect only the customers not in those two rate classes.
- In the original industrial model, there is a true/false cell that allows us to quickly turn off the scaling and restore the large volume consumption, in case we want to compare. This can be done in either the original APS scenarios or in the new 'adjusted' scenarios with updated measure assumptions.
- The Large Volume model has all the same measures applied as in the original Industrial model, with the same updated measure assumptions in the program potential.
- The Large Volume model has the following base year consumption by IESO zone and Enbridge region:

Enbridge Region	IESO Zone					Grand Total
	Essa	Ottawa	Southwest	Toronto	West	
EGD-GTA	-	-	223,233,730	3,778,271	-	**227,012,001**
EGD-Ottawa	2,041,742	-	-	-	-	**2,041,742**
Union-North	-	14,764,131	-	-	-	**14,764,131**
Union-South	-	-	934,257,195	-	2,592,083,800	**3,526,340,995**
Grand Total	**2,041,742**	**14,764,131**	**1,157,490,925**	**3,778,271**	**2,592,083,800**	**3,770,158,869**

For Discussion

We think this process has worked well, and we believe we are very close to having the industrial sector correctly mapped and segregated into large volume and the rest. In fact, the industrial sector may now be the most accurately mapped of the sectors.

We believe we do not have the Water & Wastewater Treatment sub-sector properly mapped yet, because we suspect it is not related to the sub-sector identified as Utility in the 2017 industrial consumption data. We'd like to talk about this to clarify the best approach for mapping this sub-sector.

Addendum, March 2021

EGI and PG agreed to use the APS' mapping of regional consumption for the Water and Wastewater Treatment segment.

Appendix C Adjusting Industrial Account Mapping to Resolve Exaggerated HVAC Consumption

Summary

We believe HVAC consumption in industry was exaggerated in the APS because several large petroleum refineries in Union-South were misclassified as "Plastic and Rubber Manufacturing", an industry with much higher HVAC consumption than in petroleum refineries. To confirm this observation, Enbridge should review the name and industry of the seven T2 customers we propose classifying as "Petroleum Manufacturing" in Enbridge's account data to confirm none of these are plastic manufacturers.

This finding has implications for ETSA base year and reference case development work, as well as ongoing work to support DSM planning.

Background

During the discovery sessions, Enbridge and Posterity Group agreed it was necessary to review gas consumption for HVAC in large industrial accounts. This issue had previously been flagged for further review and consideration while supporting DSM planning and IRP analysis. Specifically, there was 1.2 billion m3 of consumption by large volume customers deemed to be in the Plastics and Rubber Manufacturing industry, which has a 32% end-use share for HVAC. Enbridge and Posterity Group agreed 32% was implausibly high for a large volume industrial operation.

Posterity Group reviewed the end-use shares for the 13 industrial segments in the APS and did not identify any major issues or disagreements3. Upon examination of the specific accounts where there was a concern that HVAC consumption was too high, we determined that there is a high degree of likelihood these accounts were oil refineries that were mischaracterized as Plastics and Rubber Manufacturing in the APS and Enbridge's DSM work.

The plastics and rubber industry is estimated to use 32% of natural gas for HVAC, compared to 0.7% in petroleum refining. Shifting these accounts, namely seven T2 customers in Union South, from the plastic and rubber category to petroleum refining resolved the issue of large volume customers with implausibly large HVAC consumption.

Enbridge account data does not have a category for plastics and rubber (NAICS code 326). Previously in our DSM work with Enbridge, plastics and rubber was assumed to be grouped in with petroleum and was split out based on the ratio of these two segments' consumption in the APS (96% plastics and rubber, only 4% petroleum). Upon reviewing the accounts in Enbridge's petroleum sector, we have identified that consumption in this category is almost exclusively petroleum refineries, and that plastics and rubber is likely grouped in with the "Other Industrial" segment, which is composed of the Enbridge categories "Heavy Manufacturing", "Light Manufacturing" and "Other Industrial".

[3] We compared end-use shares to two primary sources: PG's ongoing work on Fortis BC's 2021 Long-Term Gas Resource Plan, and the US Energy Information Administration's Manufacturing Energy Consumption Survey (MECS). For all industrial segments, the APS end-use shares were very similar to both sources.

Using the external data sources listed in Table 1, we estimate the plastic and rubber industry in Ontario consumed about 150 million m3 of natural gas in 2017.

Table 1: Estimating Natural Gas Consumption of the Ontario Plastics and Rubber Manufacturing Industry (NAICS Code 326)

	Value	Source
Energy Consumption in Plastics and Rubber Manufacturing Nationally, 2017	35.4 million GJ	Statistics Canada Table 25-10-0025-01
Ontario Share of National GDP in Plastics and Rubber Manufacturing, 2017	50.4%	Calculation from Statistics Canada Table 36-10-0402-01
Estimated Share of Energy in Plastics and Rubber Manufacturing that is Natural Gas	31%	US EIA MECS Table 3.2
Resulting Estimate for Ontario Consumption	149 million m^3	Multiplying rows 1-3, converting GJ to m^3

Combined, Enbridge's internal categories of "Other Industrial", "Heavy Manufacturing", and "Light Manufacturing" consumed 640 million m3 in 2017. In place of subtracting 96% of Enbridge's petroleum sector and reclassifying it as plastics and rubber, we propose subtracting 23% (149/640) of the "Other Industrial", "Heavy Manufacturing", and "Light Manufacturing" categories for plastics and rubber.

This reclassification results in a large change (>1 billion m3) in consumption of these segments, as presented in Table 2.

Table 2: Proposed Change to Natural Gas Consumption by Segment

	Previous Mapping (Used for past DSM work)	New Mapping	Change
Agriculture	764	764	-
Chemicals Mfg	1,632	1,632	-
Fabricated Metals Mfg	447	447	-
Food and Beverage Mfg	977	977	-
Mining; Quarrying and Oil & Gas Extraction	277	277	-
Non-metallic Minerals Product Mfg	418	418	-
Other Industrial	667	518	-149
Petroleum Mfg	12	1,266	+1,254
Plastic and Rubber Mfg	1,254	149	-1,105
Primary Metals Mfg	1,624	1,624	-
Pulp; Paper; and Wood Products Mfg	728	728	-
Transportation and Machinery Mfg	180	180	-
Water & Wastewater Treatment	31	31	-
Total	**9,010**	**9,010**	**-**

Decreasing the gas demand of the plastic and rubber sector to what we believe is a more realistic estimate (149 million m3 in 2017) and subtracting this quantity from the "Other Industrial" segment, instead of from "Petroleum Refining", results in the changes to end-use demand shown in Table 3.

Table 3: Changes to End Use Demand as a Result of Reclassifying the Plastics and Rubber Sector

	Previous Mapping (Used for past DSM work)	New Mapping	Change
HVAC	1,727	1,311	-416
Other Process	522	556	+34
Process Cooling	47	49	+2
Process Heating (Direct)	4,606	5,184	+578
Process Heating (Water and Steam)	2,109	1,910	-199
Total	**9,010**	**9,010**	**-**

There are about 50 accounts in Enbridge's 2017 data classified as "Petroleum Manufacturing", but 97% of this consumption is attributable to the reclassification of the seven rate T2 accounts in Union South. While we were able to do a rudimentary search by postal code, we suggest that Enbridge verify the name and sector of each of these seven accounts, to confirm they are not in the plastics and rubber sector.

Addendum, March 2021

Following the submission of this memo correcting classification of petroleum refineries from the APS data, Enbridge was able to provide a dataset of 2019 customer consumption classified by SIC code, received by Posterity Group in January 2020. This new classification data removed the need to use the above estimation from Statistics Canada data for the plastic and rubber industry. 2019 consumption in this sector was 139 million m3, as opposed to the top-down estimate of 149 million m3, both much lower than the ~1.2 billion m3/year reported in the APS. This mapping using 2019 account classification data was used for the final submission for the industrial sector.

Appendix D Memo: Falling Program Costs

As mentioned in last week's memo, the plan for this week was to examine the impact of two model-wide assumptions:

- Declining incentive and administrative costs over time for many measures
- 100% re-adoption of all measures at the end of their life

This memo presents the findings of running these two scenarios through the PG model and comparing the results to the original APS results.

1 Declining Incentive Costs

We will examine the results from each sector separately and then show the combined results at the end. Last week's memo discussed how well the PG model matches the savings potential calculated in the APS. In this memo, the primary focus will be on the program costs. The exhibits will show the incentive costs only. In general, the administrative costs in the APS are set at 40% of the incentives, so we are leaving the administrative costs out of the exhibits for simplicity. (There is some deviation from the 40% factor for scenario A, as described in Austin's email of January 9, but we will neglect those effects here.)

1.1 Residential

Exhibit 1 shows the yearly incentive cost for the residential sector, from the detailed APS results. We have called out the incentives for Home Energy Reports, because the APS shows this measure accounting for 74% of the residential incentives in 2038 and only 2% of the residential savings. The final column of Exhibit 1 shows the APS incentive amounts without this measure.

Exhibit 3 APS Residential Program Incentives

Year	APS results: SC A Program Incentive Spending		
	All Residential	Home Energy Reports	Residential Net of Home Energy Reports
2019	14,371,766	-	14,371,766
2020	14,647,456	-	14,647,456
2021	12,570,703	12,616	12,558,087
2022	12,387,324	25,225	12,362,099
2023	12,814,987	255,011	12,559,977
2024	12,031,652	785,316	11,246,336
2025	12,983,690	1,284,725	11,698,965
2026	14,103,769	1,901,770	12,201,999
2027	15,295,778	2,640,998	12,654,780
2028	16,106,435	3,508,039	12,598,396
2029	14,700,171	4,495,822	10,204,349
2030	16,040,834	5,610,736	10,430,098
2031	17,544,740	6,753,675	10,791,065
2032	16,722,423	7,888,579	8,833,844
2033	17,800,083	9,042,003	8,758,080
2034	18,742,766	10,149,449	8,593,317
2035	17,181,233	11,147,369	6,033,864
2036	17,853,382	12,097,816	5,755,566
2037	18,550,953	13,063,745	5,487,208
2038	18,951,668	14,043,926	4,907,742
Grand Total	**311,401,814**	**104,706,820**	**206,694,995**

Exhibit 2 shows that the PG residential model tracks the APS program spending results reasonably well, as long as the Home Energy Reports measure is excluded from the APS values and as long as the declining program costs option is enabled. The middle column of Exhibit 2 shows that the PG model reports program spending a few percent below the APS numbers.[4] With incentive costs declining, the annual incentive spending falls by over 60% by the end of the study period.

When the declining program costs option is disabled, the picture is very different. The program spending rises by over 70% by the end of the study period. In fact, the spending by 2038 is higher than the APS incentive spending even with the Home Energy Reports measure excluded from the PG model.

[4] As discussed in last week's memo, the residential savings values are also somewhat below those reported by the APS. The program spending is lower because of the same measures identified in last week's memo.

Exhibit 4 Residential Program Incentive Spending: APS vs PG Model

Year	SC A Program Incentive Spending		
	APS Net of Home Energy Reports	PG Model with Declining Program Costs	PG Model with Constant Program Costs
2019	14,371,766	12,691,900	12,691,900
2020	14,647,456	12,414,416	13,615,058
2021	12,558,087	11,509,352	14,398,553
2022	12,362,099	11,395,587	15,045,779
2023	12,559,977	11,921,806	16,292,690
2024	11,246,336	10,642,228	16,720,570
2025	11,698,965	11,026,001	17,978,599
2026	12,201,999	11,451,859	18,853,442
2027	12,654,780	11,839,921	19,914,787
2028	12,598,396	11,607,013	20,572,825
2029	10,204,349	9,326,513	21,332,497
2030	10,430,098	9,554,511	21,798,928
2031	10,791,065	9,910,199	22,347,056
2032	8,833,844	7,987,963	22,210,457
2033	8,758,080	7,968,696	22,536,015
2034	8,593,317	7,873,317	22,410,930
2035	6,033,864	5,391,586	21,844,790
2036	5,755,566	5,194,968	21,828,733
2037	5,487,208	5,010,970	21,804,875
2038	4,907,742	4,509,019	21,652,740
Grand Total	**206,694,995**	**189,227,826**	**385,851,224**

1.2 Commercial

Exhibit 3 shows the yearly incentive cost for the commercial sector, from the detailed APS results. In this case we have again called out a measure that is suspect, the Education & Capacity Building measure, because the APS shows this measure accounting for 44% of the commercial incentives in 2038 and only 1% of the commercial savings. The final column of Exhibit 3 shows the APS incentive amounts without this measure.

POSTERITY GROUP

Exhibit 5 APS Commercial Program Incentives

Year	APS results: SC A Program Incentive Spending		
	All Commercial	Education & Capacity Building	Commercial Net of Education & Capacity Building
2019	15,997,089	729,346	15,267,742
2020	17,111,546	1,391,321	15,720,225
2021	17,954,305	2,074,819	15,879,486
2022	19,286,756	3,099,110	16,187,646
2023	21,287,695	3,716,121	17,571,574
2024	21,310,899	4,389,958	16,920,941
2025	22,568,575	5,055,202	17,513,374
2026	24,228,080	5,745,305	18,482,775
2027	25,740,830	6,460,989	19,279,842
2028	26,247,311	7,203,009	19,044,302
2029	23,085,287	7,980,154	15,105,132
2030	23,424,720	8,073,481	15,351,239
2031	24,186,109	8,096,259	16,089,850
2032	23,199,261	8,081,297	15,117,964
2033	23,020,285	8,118,888	14,901,396
2034	22,811,694	8,281,267	14,530,428
2035	22,249,295	8,446,901	13,802,394
2036	21,689,642	8,615,831	13,073,811
2037	21,251,661	8,788,151	12,463,510
2038	20,506,111	8,963,909	11,542,202
Grand Total	**437,157,150**	**123,311,317**	**313,845,833**

Exhibit 4 shows that the PG commercial model tracks the APS program spending results reasonably well, as long as the Education & Capacity Building measure is excluded from the APS values and as long as the declining program costs option is enabled. The middle column of Exhibit 4 shows that the PG model reports program spending within a few percent of the APS numbers.[5] With incentive costs declining, the annual incentive spending falls by approximately 25% by the end of the study period.

When the declining program costs option is disabled, the picture is very different. The program spending roughly doubles by the end of the study period. In fact, the spending by 2038 is higher than the APS incentive spending even with the Education & Capacity Building measure excluded from the PG model.

[5] As discussed in last week's memo, the commercial savings values by 2038 are somewhat below those reported by the APS. The program spending is lower because of the same measures identified in last week's memo.

Exhibit 6 Residential Program Incentive Spending: APS vs PG Model

Year	SC A Program Incentive Spending		
	APS Net of Education & Capacity Building	PG Model with Declining Program Costs	PG Model with Constant Program Costs
2019	15,267,742	15,835,580	15,835,580
2020	15,720,225	16,089,367	17,598,882
2021	15,879,486	16,495,260	20,071,324
2022	16,187,646	17,288,823	21,514,104
2023	17,571,574	18,619,011	23,662,610
2024	16,920,941	18,118,334	25,497,316
2025	17,513,374	18,653,409	27,832,599
2026	18,482,775	19,371,225	29,515,301
2027	19,279,842	20,055,812	30,944,063
2028	19,044,302	19,764,284	32,324,684
2029	15,105,132	15,801,107	32,665,434
2030	15,351,239	15,241,959	32,256,078
2031	16,089,850	15,317,256	32,576,602
2032	15,117,964	14,628,292	32,679,299
2033	14,901,396	14,281,782	32,695,847
2034	14,530,428	13,981,101	32,791,012
2035	13,802,394	13,179,584	32,446,670
2036	13,073,811	12,501,644	32,064,651
2037	12,463,510	12,033,362	32,298,009
2038	11,542,202	11,222,669	31,514,618
Grand Total	**313,845,833**	**318,479,862**	**568,784,683**

1.3 Industrial

Exhibit 5 shows that the PG industrial model tracks the APS program spending results reasonably well, as long as the declining program costs option is enabled. There were no measures that were suspect for the industrial sector. The middle column of Exhibit 5 shows that the PG model reports program spending within a few percent of the APS numbers.[6] With incentive costs declining, the annual incentive spending falls by over 40% by the end of the study period.

When the declining program costs option is disabled, the picture is very different. The program spending remains roughly constant over the study period, rising by about 15% and then falling back down to just above the 2019 levels.

[6] As discussed in last week's memo, the industrial savings values by 2038 are somewhat below those reported by the APS. The program spending is lower because of the same measures identified in last week's memo.

Exhibit 7 Industrial Program Incentive Spending: APS vs PG Model

	SC A Program Incentive Spending		
Year	APS Industrial Incentives	PG Model with Declining Program Costs	PG Model with Constant Program Costs
2019	26,661,712	24,770,912	24,770,912
2020	25,360,708	24,959,363	28,123,021
2021	25,924,038	25,609,370	32,728,763
2022	24,628,275	24,274,458	32,427,118
2023	22,194,343	21,783,443	30,126,351
2024	18,296,561	17,941,493	28,589,766
2025	17,600,872	17,174,588	28,079,256
2026	18,139,775	17,674,890	29,280,822
2027	17,233,287	16,694,436	28,393,973
2028	15,841,179	15,280,231	27,736,937
2029	15,433,214	14,939,822	27,858,975
2030	15,590,986	15,090,283	28,093,442
2031	16,275,316	15,699,598	28,560,410
2032	16,289,790	15,729,017	28,566,487
2033	16,171,496	15,634,511	28,428,581
2034	15,831,760	15,335,416	28,050,997
2035	15,430,228	14,976,937	27,555,939
2036	14,970,502	14,562,421	26,935,930
2037	14,461,298	14,096,996	26,268,714
2038	14,336,530	14,017,109	25,785,080
Grand Total	**366,671,869**	**356,245,293**	**566,361,473**

1.4 Three-Sector Summary

Exhibit 6 shows the total APS program incentive spending results for all three sectors. The middle column shows the total incentives for the Home Energy Reports measure and the Education & Capacity Building measure. The last column shows the APS program incentive spending net of these two measures.

Exhibit 8 APS Three-Sector Program Incentives

Year	SC A Program Incentive Spending		
	APS Incentives	Two High-Incentive Measures	APS Incentives Net of High-Incentive Measures
2019	57,030,567	729,346	56,301,220
2020	57,119,711	1,391,321	55,728,390
2021	56,449,046	2,087,435	54,361,611
2022	56,302,355	3,124,335	53,178,020
2023	56,297,025	3,971,132	52,325,893
2024	51,639,113	5,175,274	46,463,839
2025	53,153,138	6,339,927	46,813,211
2026	56,471,624	7,647,075	48,824,549
2027	58,269,895	9,101,987	49,167,908
2028	58,194,925	10,711,048	47,483,877
2029	53,218,672	12,475,976	40,742,696
2030	55,056,540	13,684,217	41,372,323
2031	58,006,164	14,849,934	43,156,230
2032	56,211,474	15,969,876	40,241,599
2033	56,991,864	17,160,891	39,830,973
2034	57,386,220	18,430,716	38,955,505
2035	54,860,756	19,594,270	35,266,486
2036	54,513,526	20,713,647	33,799,879
2037	54,263,912	21,851,896	32,412,016
2038	53,794,308	23,007,835	30,786,473
Grand Total	**1,115,230,834**	**228,018,136**	**887,212,698**

Exhibit 7 shows that the PG model tracks the APS program spending results reasonably well, as long as the Home Energy Reports and Education & Capacity Building measures are excluded from the APS values and as long as the declining program costs option is enabled. The middle column of Exhibit 7 shows that the PG model reports program spending within a few percent of the APS numbers. With incentive costs declining, the annual incentive spending falls by over 40% by the end of the study period.

When the declining program costs option is disabled, the picture is very different. The program spending increases nearly 50% by the end of the study period. In fact, the spending by 2038 is higher than the APS incentive spending even with the Home Energy Reports and Education & Capacity Building measures excluded from the PG model. If administrative costs were included, assuming they are approximately 40% of incentive costs, the total spending by 2038 would exceed $110 million per year.

POSTERITY GROUP

Exhibit 9 Three-Sector Program Incentive Spending: APS vs PG Model

Year	SC A Program Incentive Spending		
	APS Incentives Net of High-Incentive Measures	PG Model with Declining Program Costs	PG Model with Constant Program Costs
2019	56,301,220	53,298,392	53,298,392
2020	55,728,390	53,463,146	59,336,961
2021	54,361,611	53,613,983	67,198,640
2022	53,178,020	52,958,868	68,987,001
2023	52,325,893	52,324,260	70,081,652
2024	46,463,839	46,702,055	70,807,652
2025	46,813,211	46,853,998	73,890,454
2026	48,824,549	48,497,973	77,649,565
2027	49,167,908	48,590,169	79,252,823
2028	47,483,877	46,651,528	80,634,447
2029	40,742,696	40,067,442	81,856,906
2030	41,372,323	39,886,753	82,148,447
2031	43,156,230	40,927,052	83,484,067
2032	40,241,599	38,345,272	83,456,243
2033	39,830,973	37,884,989	83,660,443
2034	38,955,505	37,189,834	83,252,938
2035	35,266,486	33,548,107	81,847,399
2036	33,799,879	32,259,033	80,829,315
2037	32,412,016	31,141,329	80,371,599
2038	30,786,473	29,748,798	78,952,437
Grand Total	**887,212,698**	**863,952,981**	**1,520,997,380**

2 Measure Re-Adoption

The APS assumed that all measures will be re-adopted by program participants at the end of their expected useful life. This is a reasonable assumption for many measures, particularly those that will later be superseded by a standard or code change from which it is impossible to go back. For behavior measures, such as use of a clothesline instead of a clothes dryer, it is commonly assumed that utility promotion is essential to preventing some participants from abandoning the behavior and going back to old habits.

PG ran a scenario in which re-adoption rate was set to 0% for all measures. The scenario began with the Constant Program Costs scenario shown above, and maintained all the same participation rates developed in the APS. In general, this means the total savings are lower. As a specific example, consider a measure with 10% participation and a life expectancy of 10 years. If the measure is a non-lost-opportunity measure (meaning people can adopt it at any time), the following scenario might play out:

- Each year of the study, out of 1,000 customers, 10% of those remaining adopt the measure. In the first year 100 adopt, then 90, and so on. At the end of 10 years, 652 customers have adopted.
- Under the APS scenario, in year 11, the 100 customers from the first year re-adopt with no new incentives paid to them. Another 35 new adopters are paid new incentives, and the process continues. At the end of 20 years, 879 customers adopted the measure and 121 did not. 879 incentives would have been paid out over the 20 years.
- Under the 0% re-adoption scenario, in year 11, the 100 original customers are added back into the potential for the year. If the participation rate is still 10%, in year 11 there are 45 adopters, so the number of adopters by the end of year 11 is actually reduced by 55.
- By the end of 20 years, 486 customers adopted the measure and 514 did not. Over that period, a total of 1,183 incentives would have been paid, because a number of customers were paid again to re-adopt. If left long enough, this measure reaches a steady state, with about 475 customers having the measure installed in any given year.
- For this measure, eliminating free re-adoption reduced the savings by about 45% and increased the incentive costs by 35%.
- For a measure with higher participation, the difference in savings would be less pronounced, but the number of customers paid to re-adopt would increase. With 100% participation, there would be no savings difference, but everyone would be paid to re-adopt twice, so the incentive costs would be doubled.
- For a measure with a shorter life, the difference would be more pronounced. For example, for a measure with a five-year life and the same participation, eliminating free re-adoption would reduce the savings by about 67% and increase the incentive costs by about 68%.

For a given measure, the amount of cumulative incentive spending required per unit of annual savings at the end of the study will be more, because some participants will have been paid incentives twice (or more), instead of only once under the APS assumptions. The results of our scenario show this effect.

PG has not presented exhibits for this scenario in this memo, partly to avoid making the memo excessively long and partly because we do not believe an assumption of 0% re-adoption is defensible. Some measures do tend to get re-adopted without incentives at the end of their lives and others do not. The APS includes numerous long-lived measures that might be affected by future (as-yet-unknown) code or standards changes by their end of life, and not that many behavior measures subject to customer backsliding.

The PG model includes the ability to vary re-adoption rate measure by measure. If data can be obtained to support the development of re-adoption rates for individual measures, or for types of measures, we can run the model with those rates included. If such data cannot be obtained, our recommendation would be to keep the 100% re-adoption assumption and focus on other issues.

3 Next Steps

PG have carried the analysis of the APS DSM model as far as we can without further input from Enbridge. The next steps, as we understand them, are as follows:

- We are ready to incorporate new assumptions for targeted measures in collaboration with Enbridge staff.

- In parallel, we will continue with the IRP work, specifically developing the set of load shapes for the legacy Union regions.
- We are also interested in developing the sensitivity tool that has been discussed. The scope for this task needs to be finalized. We also look forward to getting key input on the design specifications for the tool.

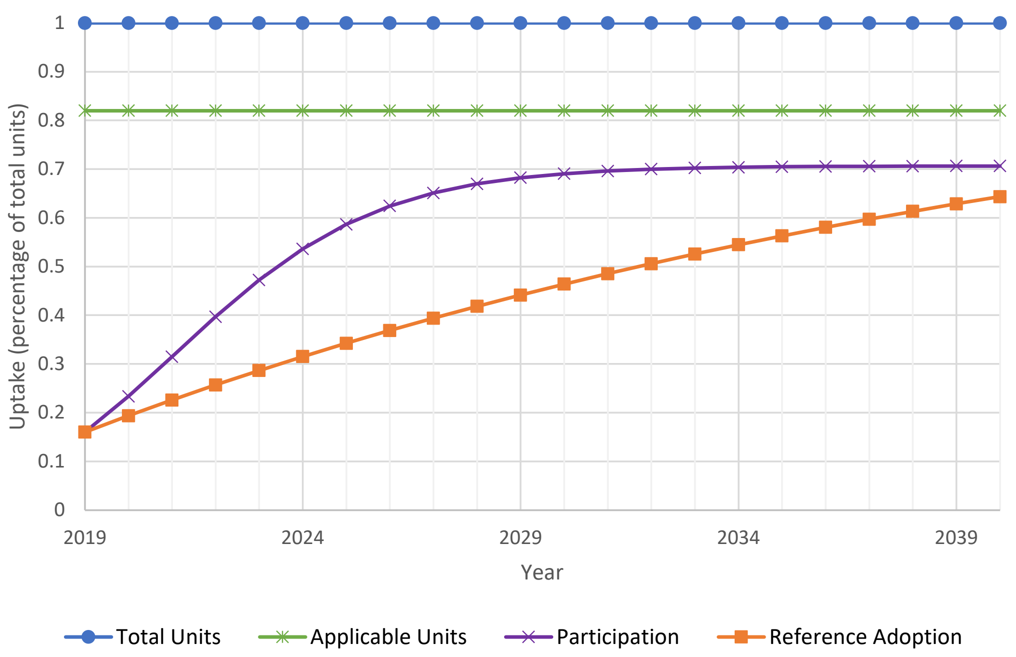
Appendix E Theoretical Achievable Potential Analysis – Method Description

1 Application of Payback Acceptance and Diffusion Curves

The incentivization of measures increases their uptake in the market. It is important to characterize this increase to determine the market potential of possible Enbridge program offerings. The increased uptake is denoted here as the participation rate. This memo describes the initial procedure for generating participation rates used in PG's Navigator model.

Related to the participation rate are the reference adoption and applicable units. Reference adoption is the amount of uptake a measure would have without incentivization. Applicable units are the number of units that could be affected by a particular measure, for example, in the residential sector the total units is the total number of houses, and the applicable units of a measure like basement insulation would be less than 1, because not all houses have basements. See Exhibit 1 for an example showing participation rate, reference adoption and applicable units.

Exhibit 10: Example participation rate, reference adoption and applicable units



Participation rates can be estimated using the combination of two curve types, payback acceptance curves and diffusion curves. Payback acceptance curves are used to calculate the percentage of buyers that would be willing to purchase a widget in return for a certain payback. This percentage is known as the widget's equilibrium market share. Improving payback periods increases equilibrium market share.

Diffusion curves represent the percentage of customers who become fully aware of a widget and its payback. The awareness of widgets and their incentives diffuses into the market due to things like word of mouth or advertising. By multiplying the diffusion curve by the equilibrium market share, the participation rate curve can be calculated. See Exhibit 2 and Exhibit 3 for an example of a payback acceptance curve and a diffusion curve, respectively.

For the Enbridge model, the payback acceptance curves were evaluated with an incentive of zero to determine equilibrium market share of the measure with no incentive. These unsubsidized market shares were used as reference adoption in order to calculate participation with a non-zero incentive program. Changes to payback caused by a non-zero incentive cause the market share to increase, the difference in between the post- and pre-incentive market shares is taken to be the participation.

This method of estimating participation rate was adapted from work done by Navigant Consulting and by Optimal Energy. Navigant used surveys of individuals in residential, commercial, and industrial sectors to determine payback curves, and they used a Bass diffusion model to calculate diffusion curves (Navigant, 2013). Optimal Energy used a panel of experts to estimate their payback acceptance and diffusion curves (Optimal Energy, 2018).

Posterity group adapted the findings from these reports to create a library of payback acceptance and diffusion curves. To fit these data outputs (Optimal Energy, 2018), a logistic function equation of this form was used:

$$y = \frac{a}{1 + e^{(x-m)/t}} + s$$

Where:

- y is the resulting value (equilibrium market share or uptake),
- x is the input value (payback period or year),
- a is the amplitude,
- m is the x value of the midpoint of the curve,
- t is the time constant or rate of decay of the curve, and
- s is the y-shift of the curve.

The Optimal Energy diffusion curves differ by measure type. Examples of the available residential curves are presented below in Table 1.

Table 1: Optimal Residential Payback Acceptance and Diffusion Curves

Payback/Diffusion Curve ID	Description
Simple Replace	Technologies that are relatively inexpensive and easy to install, such as an LED light bulb
High Cost Replace (non-discretionary)	High-cost installations that are required, such as replacing a boiler or furnace at end-of-life

High Cost Replace (Discretionary)	High-cost installations that are not required, such a replacing a boiler or furnace before end-of-life
Active Engagement	Optional engagement-related energy measures, such as a furnace tune-up
Low-Cost Complex	Relatively low-cost measures that are more complicated to install than “Simple Replace” measures, such as draft proofing
High-Cost Complex	High-cost, complex measures such as floor insulation
Emerging Technologies	New technologies with little existing market penetration

For each sector, measures were assessed on a case-by-case basis and assigned to one of the curves.

Three steps are needed to modify these curves from their “library” form to make them more accurately represent the measure participation rates.

The payback acceptance curve is scaled along its x-axis as a function of measure lifespan, since measures with shorter lifespans are less likely to be adopted than those with longer lifespans, given the same payback period. This factor was not included in the Navigant or Optimal methods but was deemed necessary by Posterity to account for differing measure lifetime.

The diffusion curve is scaled along its x-axis as a function of baseline system lifespan, but only if measures are replace on burnout (ROB). Awareness of a measure grows more slowly if only a fraction of buildings can be retrofitted at any one time (Navigant Consulting, 2011).

Lastly, the diffusion curve is shifted in the x-direction so that the initial participation matches the reference adoption in the base year. I.e., if the market is mature for a certain product, at year 0 the starting value would already be partway up the diffusion curve. These modifications are shown in Exhibit 2 and Exhibit 3.

Exhibit 11: Example payback adoption curve, with demonstration of how it is modified based on measure lifespan

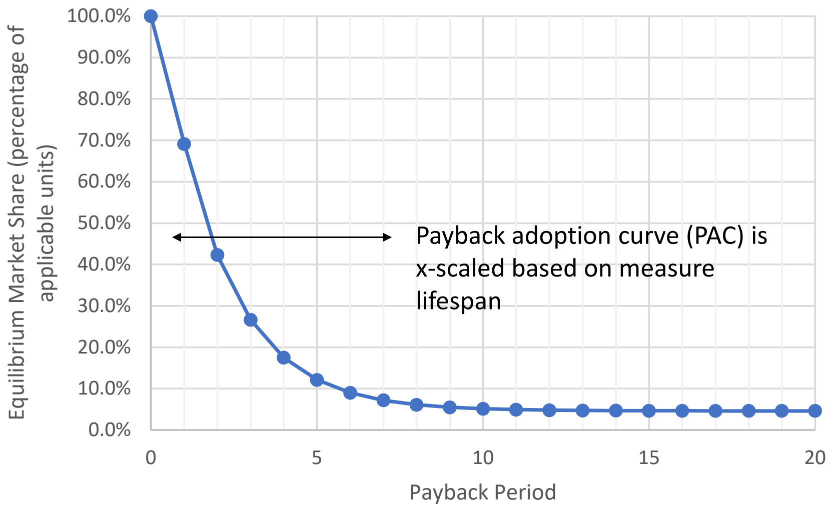
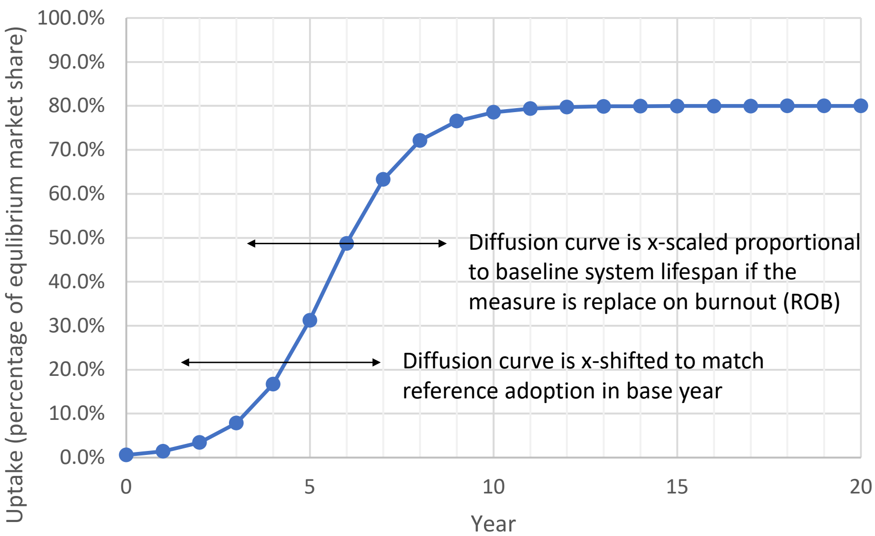


Exhibit 12: Example diffusion curve with demonstration of how the curve is modified for ROB measures



Since there were more curve types available from Optimal's analysis, it was decided to use those curves rather than those from Navigant. Once the curves were selected and modified in the ways described above, the participation rate (as a percentage of applicable units) is calculated. This is then converted into a form that the Navigator model can accept (the participation rate as the net of the reference adoption) and entered into the Navigator.

The payback acceptance curve for all measures in each sector were evaluating at seven different levels of incentive, each an increasing share of the measure's un-subsidized incremental. Each increase in incentive produces higher measure uptake and total program spending. To estimate program spending, all measures were assumed to have an administration cost equal to 40% of the incentive payment.

Achievable potential savings, units affected, associated budget and % of total economic potential were modelled for 10, 20, 30, 40, 60, 80, and 100 percent incremental incentive options.

References

Navigant. (2013). *Demand Side Resource Potential Study Report: Kansas City Power and Light.*

Navigant Consulting. (2011). *Clean Technology Diffusion Simulator - Forio Simulate*. Retrieved from https://forio.com/simulate/navigantsimulations/technology-diffusion-simulation/run/

Optimal Energy. (2018). *Study of Potential for Energy Savings in New Orleans.*

DSM PLAN INPUTS

Input Assumptions and Adjustment Factors

1. For the purpose of forecasting DSM results and establishing targets for this application, Enbridge Gas has applied input assumptions and adjustment factors, which include net-to-gross ("NTG") adjustments and verification adjustments. As was outlined in the Proposed Framework in Exhibit C, Schedule 1, Tab 1, input assumptions include natural gas savings, electricity impacts, water impacts, estimated useful life ("EUL"), and equipment cost. Further outlined in the Proposed Framework, adjustment factors are used to determine the final net savings to be claimed by the gas utility.

2. For measures that currently exist in the Technical Resource Manual ("TRM"),[1] Enbridge Gas has applied the input assumptions for the purposes of forecasting DSM results and setting targets. The current TRM (Version 5.0, dated November 12, 2020 and released on December 3, 2020) was completed by the OEB's Evaluation Contractor ("EC") as part of its evaluation process of the 2019 program results. In order to claim energy savings results, Enbridge Gas will continue to use the TRM, accounting for any future TRM updates as appropriate.

3. For measures that do not exist in the TRM, for example, for commercial custom projects or residential whole home projects (excluding the new measures described below), Enbridge Gas used best available input assumptions at the time of the submission of this Application for the purposes of forecasting DSM results and proposing targets. In order to claim energy savings results, Enbridge Gas will use project specific input assumptions to estimate savings. There is one exception, which is the EUL input assumption. As has been outlined in Section 9.0 of the

[1] EB-2015-0245, 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

Proposed Framework, Enbridge Gas will use the EULs provided in Attachment 1 Attachment 2 in order to determine actual results, until such time as EUL values are re-evaluated through the OEB led EM&V planning process.

4. For the purposes of forecasting DSM results and proposing targets, Enbridge Gas used the best available adjustment factors at the time of submission of this application for all measures and offerings. In order to claim energy results, Enbridge Gas will use the NTG adjustments provided in Attachment 1 until such time as NTG values are re-evaluated through the OEB-led EM&V audit process.

5. As outlined in Section 9.2.1 of the Proposed Framework, changes to NTG adjustments can be applied retroactively or prospectively, depending on the relevant offering's implementation approach.[2] Table 1 below details the implementation approach for each offering in Enbridge Gas's DSM Plan. NTG adjustments are not applicable to certain offerings, specifically those that do not include the gross measurement of natural gas savings. As such, only relevant offerings are included in the table below.

Table 1: DSM Program Offerings and Associated Implementation Approaches

Program – Offering	Implementation Approach
Residential – Whole Home	Mass-market
Residential – Single Measure	Mass-market
Residential – Smart Home	Mass-market
Commercial – Prescriptive Downstream	Mass-market
Commercial – Prescriptive Midstream	Mass-market
Commercial – Direct Install	Mass-market
Commercial – Commercial Custom	One-to-one
Industrial – Industrial Custom	One-to-one
Large Volume – Direct Access	One-to-one
Energy Performance – Whole Building P4P	One-to-one

[2] As defined in Section 9.3 of the Proposed Framework, any changes to NTG adjustments for offerings with one-to-one implementation approaches are applied retroactively since the utility had direct control of in-year application approvals for the offering. Further, any changes to NTG adjustments for offerings with mass-market implementation approaches are applied prospectively since the utility cannot control individual in-year application approvals for the offering.

New Prescriptive Measure Input Assumptions and Adjustment Factors

6. In the development of this Application, Enbridge Gas has introduced six prescriptive measures, which are new to the Company's DSM programming and have not yet been included in the TRM review process.

7. For these new measures, Enbridge Gas expects to provide research to the EC fExor their inclusion into a future TRM update. To forecast DSM results, Enbridge Gas has used placeholder input assumptions for these measures. The input assumptions are informed by internal analysis and TRMs from other jurisdictions. Table 2 details these placeholder input assumptions and adjustment factors for the new measures included in this application.

Table 2: Input Assumptions and Adjustment Factors for New Measures

	Attic Insulation	Wall Insulation	Basement Insulation	Energy Star Commercial Combi Oven	Energy Star Commercial Griddle	High Efficient Commercial Conveyor Oven
Base Case	Existing	Existing	Existing	Convection Oven	Non ENERGY Star Griddle	Stand. Effcy. Conveyor Oven
Sector	Residential	Residential	Residential	Commercial	Commercial	Commercial
Natural Gas (m^3)	178	293	182	2,287	534	2,175
Electricity (kWh)	172	109	208	0	0	0
Water (L)	0	0	0	0	0	0
EUL (years)	30	30	30	12	12	12
Incremental Cost ($)	1,671	3,261	1,551	4,470	1,069	3,613
Free Rider (%)	33%	33%	33%	20%	20%	20%
Decision Type	Retrofit	Retrofit	Retrofit, TNR & NC	Retrofit, TNR & NC	Retrofit, TNR & NC	Retrofit, TNR & NC

8. As outlined in Exhibit D, Tab 1, Schedule 3, Enbridge Gas will update its 2022 targets once the measure research and substantiation has been provided to the EC. For the purpose of claiming energy savings results, Enbridge Gas will use the researched values provided to the EC following the TRM process outlined in Section 8.5 of the Proposed Framework, rather than the placeholder values provided above.

Subsequently, any changes to the input assumptions and adjustment factors for the measures above in future years will follow the processes outlined in Section 9.3 of the Proposed Framework.

Avoided Costs

9. In line with Section 11 of the Proposed Framework, Enbridge Gas applied the most recently available avoided costs in the development of its new multi-year DSM Plan (Attachment 3).[3] Enbridge Gas will update its avoided costs each year and report DSM results based on the avoided costs for that year.

10. Enbridge Gas will continue to develop two sets of avoided costs (for the EGD rate zone and the Union rate zones) to account for differences in avoided costs between the rate zones, and will track results based on the rate zone to which they are attributed. If it becomes appropriate to develop one set of avoided costs for all rate zones, (for example, if the avoided costs do not differ between rate zones) Enbridge Gas will do so at that time.

11. Currently, the following avoided costs differ between the EGD rate zone and the Union rate zones:
    - Avoided natural gas costs (to account for differences in natural gas system and supply costs between the rate zones)
    - Avoided water costs (to account for differences in municipal water costs between the rate zones)

12. Avoided electricity costs are consistent between the EGD rate zone and the Union rate zones, as avoided electricity costs are developed at a provincial level. Avoided carbon costs are also consistent between rate zones, as avoided carbon costs are

[3] At the time of submission, the 2021 DSM avoided costs were the most recently available DSM avoided costs.

set at a federal level. However, avoided carbon costs are applied to the EGD rate zone and the Union rate zones separately, to account for differences in customer mix between the rate zones, as some customers are not subject to the Federal Carbon Charge.

13. In 2020, Enbridge Gas conducted a jurisdictional scan to better understand whether the components of its DSM avoided costs remain appropriate. Based on the scan, Enbridge Gas concluded that no changes were needed to its DSM avoided cost components (see DSM Avoided Costs Jurisdictional Scan section below).

14. Specifically, Enbridge Gas is using the following approaches and information for its DSM avoided cost components.

- Avoided natural gas commodity costs, avoided natural gas upstream transportation and third-party services, and avoided natural gas seasonal storage requirement costs: Based on supply planning models (i.e. SENDOUT©) and inputs, for the EGD rate zone and the Union rate zones separately.
- Avoided unaccounted for natural gas fuel losses: Based on OEB approved unaccounted for gas annual rate, applied to all rate zones.
- Avoided natural gas downstream infrastructure costs: Based on the 2015 Navigant Avoided Distribution Costs report for the EGD rate zone, and the 2018 ICF Assessment of Union Avoided Local Distribution System Infrastructure Costs report for the Union rate zones.
- Avoided costs, other resources (electricity): [4] Based on the IESO's wholesale weighted average rate, for both the EGD rate zone and the Union rate zones.

[4] Does not include potential avoided infrastructure costs.

- Avoided costs, other resources (water): Based on the average rates of retail cost of water, from the municipalities within the EGD rate zone and the Union rate zones separately, adjusted to reflect a wholesale cost.
- Avoided carbon costs: Based on the Federal Carbon Charge, applied by rate class, weighted by the customer volume forecast subject to the Federal Carbon Charge.

DSM Avoided Costs Jurisdictional Scan

15. In 2020, Enbridge Gas engaged Guidehouse Inc. to conduct a jurisdictional scan to investigate industry practices for DSM avoided costs (see Attachment 4). Enbridge Gas commissioned the scan to better understand whether the components of its DSM avoided costs remain appropriate.

16. The scan included the following jurisdictions:[5]
    - California
    - Colorado
    - Illinois
    - Massachusetts
    - Michigan
    - Minnesota
    - New York
    - Vermont
    - Wisconsin

17. The report includes the following findings:[6]

---

[5] Guidehouse Inc., DSM Avoided Costs Study – Jurisdictional Review (April 20, 2021), pp. 1-2, filed at Exhibit E, Tab 5, Schedule 1, Attachment 4.
[6] Guidehouse Inc., DSM Avoided Costs Study – Jurisdictional Review (April 20, 2021), pp. 2-4, filed at Exhibit E, Tab 5, Schedule 1, Attachment 4.

- Lack of consistency across jurisdictions reviewed: "For example, while all jurisdictions include avoided natural gas commodity costs and use a similar process to calculate the avoided commodity cost, treatment of natural gas delivery costs is not consistent. In fact, no two jurisdictions use the same approach for avoided natural gas delivery costs.[7]
- Demand reduction induced price effects (DRIPE): DRIPE is not included in eight of the nine jurisdictions reviewed.
- Water costs: Avoided water costs are included in approximately one-half of the jurisdictions reviewed.
- Infrastructure costs: Avoided infrastructure costs are included or accounted for in approximately one-half of the jurisdictions reviewed, however inconsistent approaches are used across different jurisdictions.
- Carbon costs: Avoided carbon costs are included in eight of the nine jurisdictions reviewed.

18. Based on the findings of the scan, Enbridge Gas concluded that it appropriately accounts for all avoided cost components that are material to DSM programs. The components are outlined in Section 11 of the Proposed Framework as well as in paragraph 14 above.

[7] Ibid, p. 2.

NET TO GROSS AND EUL VALUES

Sector	NTG
Commercial Program	
MUSH (Municipalities, Universities, Schools, Hospitals)	29.50%
Multi-Residential	70.60%
Other Commercial	30.70%
Operational Improvement	75.00%
Industrial Program	
Industrial	37.80%
Agriculture / Greenhouses	51.00%
Large Volume Industrial Program	
Large Volume	15.31%

Target Market		**Equipment Details**		**Prescriptive Offer**	**Direct Install Offer**	**Midstream Offer**
Sector	**Decision Type / Measure Category**	**Efficient Equipment**	**Building/ Space Type/ Size**	**NTG**	**NTG**	**NTG**
Commercial Cooking	New Construction / Natural Replacement	Energy Star Fryer		80%	80%	80%
Commercial Cooking	New Construction / Natural Replacement	Energy Star Convection Ovens		80%	80%	80%
Commercial Cooking	New Construction / Natural Replacement	Energy Star Steam Cookers		80%	80%	80%
Commercial Cooking	New Construction/ Natural Replacement	High Efficiency Under-Fired Broiler	All sizes	80%	80%	80%

Target Market		Equipment Details		Prescriptive Offer	Direct Install Offer	Midstream Offer
Sector	**Decision Type / Measure Category**	**Efficient Equipment**	**Building/ Space Type/ Size**	**NTG**	**NTG**	**NTG**
Commercial Cooking	New Construction/ Natural Replacement	Energy Star Rack Oven	All sizes	80%	80%	80%
Commercial Space Heating	New Construction / Retrofit	Energy Recovery Ventilation (ERV)	All segments and efficiencies	30%	95%	95%
Commercial Space Heating	New Construction / Retrofit	Heat Recovery Ventilation (HRV)	All segments and efficiencies	95%	95%	95%
Commercial Space Heating	New Construction / Natural Replacement	Energy Recovery Ventilation (ERV) - Incremental	All segments and efficiencies	30%	95%	95%
Commercial Space Heating	New Construction / Natural Replacement	Heat Recovery Ventilation (HRV) - Incremental	All segments and efficiencies	95%	95%	95%
Commercial Space Heating	New Construction /Retrofit	Air Curtain - Pedestrian Doors	All sizes	50%	95%	95%
Commercial Space Heating	New Construction /Retrofit	Air Curtain - Dock-In Shipping and Receiving Doors	All sizes	50%	95%	95%

Target Market		**Equipment Details**		**Prescriptive Offer**	**Direct Install Offer**	**Midstream Offer**
Sector	**Decision Type / Measure Category**	**Efficient Equipment**	**Building/ Space Type/ Size**	**NTG**	**NTG**	**NTG**
Commercial Space Heating	New Construction /Retrofit	Air Curtain - Drive-In Shipping and Receiving Doors	All sizes	50%	95%	95%
Commercial Space Heating	Retrofit	Dock Door Seals	All sizes	50%	95%	95%
Commercial Space Heating	New Construction/ Natural Replacement	Condensing Make Up Air Unit (MUA)	All types and segments	95%	95%	95%
Commercial Space Heating	New Construction / Natural Replacement	Condensing Unit Heater	All sizes	100%	100%	100%
Commercial Space Heating	New Construction/ Natural Replacement / Retrofit	Demand Control Kitchen Ventilation	All sizes	62%	95%	95%
Commercial Space Heating	New Construction/ Natural Replacement	Demand Control Ventilation	All segments	8%	80%	80%
Commercial Space Heating	Retrofit	Demand Control Ventilation	All segments	8%	95%	95%
Commercial Space Heating	New Construction / Retrofit	Destratification Fans	All sizes	90%	90%	90%

Target Market		**Equipment Details**		**Prescriptive Offer**	**Direct Install Offer**	**Midstream Offer**
Sector	**Decision Type / Measure Category**	**Efficient Equipment**	**Building/ Space Type/ Size**	**NTG**	**NTG**	**NTG**
Commercial Space Heating	New Construction / Natural Replacement	High Efficiency Condensing Furnace		82.5%	82.5%	82.5%
Commercial Space Heating	New Construction / Retrofit	Infrared Heater	All types and sizes	7%	67%	67%
Multi-Residential Water Heating	Retrofit	Faucet Aerator	All types and efficiencies	90%	90%	90%
Multi-Residential Water Heating	New Construction / Retrofit	Low-flow showerhead	All efficiencies	90%	90%	90%
Commercial Water Heating	New Construction / Natural Replacement	Condensing Storage Water Heater	All sizes and segments	95%	95%	95%
Commercial Water Heating	New Construction / Natural Replacement	Condensing Tankless Water Heater	All sizes and segments	98%	98%	98%
Commercial Water Heating	New Construction / Natural Replacement	Energy Star Dishwasher - Conveyor type	All temps	73%	73%	73%
Commercial Water Heating	New Construction/ Natural Replacement	Energy Star Dishwasher - Stationary door type	All temps	80%	80%	80%
Commercial Water Heating	New Construction/ Natural Replacement	Energy Star Dishwasher - Undercounter	All temps	60%	60%	60%

Target Market		Equipment Details		Prescriptive Offer	Direct Install Offer	Midstream Offer
Sector	**Decision Type / Measure Category**	**Efficient Equipment**	**Building/ Space Type/ Size**	**NTG**	**NTG**	**NTG**
Commercial Water Heating	New Construction / Retrofit	Ozone Laundry Treatment	All types and sizes	92%	92%	92%
Residential Space Heating	New Construction / Natural Replacement	97% or Higher Efficiency Furnace		100%	N/A	N/A
Residential Space Heating	New Construction / Retrofit	Adaptive Thermostat	All install types	96%	N/A	N/A
Residential Space Heating	Retrofit	Heat Reflector Panels		100%	N/A	N/A
Residential Space Heating	Retrofit	Programmable Thermostat		57%	N/A	N/A
Residential Water Heating	Retrofit	Faucet Aerator	All types and efficiencies	67%	N/A	N/A
Residential Water Heating	New Construction	High Efficiency Gas Storage Water Heaters		100%	N/A	N/A
Residential Water Heating	New Construction / Retrofit	Low-flow showerhead	All efficiencies	90%	N/A	N/A
Residential Water Heating	Retrofit	Pipe Wrap		96%	N/A	N/A
Residential Water Heating	New Construction / Natural Replacement	Tankless Water Heater	All types and efficiencies	98%	N/A	N/A

	NTG
Residential - Whole Home	95%
Residential - Air Sealing (single measure)	95%
All Low Income (Single Family, Multi-Family)	100%
Commercial - Whole Building P4P	100%

	EUL
Residential - Whole Home	25 yrs.
Residential - Air Sealing (single measure)	15 yrs.
Low-Income - Whole Home	25 yrs.
Commercial - Whole Building P4P	10 yrs.

COMMERCIAL/INDUSTRIAL CUSTOM EUL GUIDELINE

Technology	Equipment Type	Sector	EUL
Boilers	Industrial Process - greater than 2500 MBHp	Industrial	25 yrs.
	Space heating - Under 300 MBHp	Commercial & Multi-Residential	25 yrs.
	Space heating - 300 to 2500 MBHp	Commercial & Multi-Residential	25 yrs.
	Domestic Hot Water	Commercial & Multi-Residential	25 yrs.
	Controls (Non Burner Mod.)	All	15 yrs.
	Controls (Burner Modification)	All	20 yrs.
	Air Makeup (line)	Industrial	15 yrs
	Oxy-Fuel	Industrial	20 yrs.
	Low NOx Boiler	Industrial	25 yrs.
Building Optimization	Operational Improvement	Commercial	5 yrs.
Economizers	Conventional and condensing	Industrial & Commercial	20 yrs.
Electronic Burner Control	Linkage-Less Controls, Modulating Motors, Mod Motors	Industrial & Commercial	20 yrs.
Agriculture	IR Poly	Greenhouse	5 yrs.
	Energy Curtains	Greenhouse	10 yrs.
	Grain Dryer	Commercial	20 yrs.
HVAC	Air Curtains (single and double door)	Commercial	15 yrs.
	High Speed Doors		15 yrs.
	Building Automation System - New	Industrial & Commercial	15 yrs.
	Cooling tower for HVAC systems	Commercial	15 yrs.
	Destratification		15 yrs.
	Dessicant Cooling	Industrial & Commercial	15 yrs.
	Exhaust Fan Controls	Commercial	15 yrs.
	Heat Recovery (COM)	Commercial	15 yrs.

Technology	Equipment Type	Sector	EUL
	Heat Recovery (IND)	Industrial	20 yrs.
	Infiltration Controls - Dock Seals	Commercial	10 yrs.
	Infiltration Controls - Air Doors	Industrial & Commercial	15 yrs.
	Advance Building Automation System	Commercial & Multi-Residential	15 yrs.
	Demand Control Ventilation	Industrial & Commercial	15 yrs.
	Make-Up Air	All	15 yrs.
	Heat Reflector Panels	Commercial & Multi-Residential	15 yrs.
	VFD retrofit on MUA	Commercial / Multi-Residential and Industrial	15 yrs.
	Infrared heaters	Industrial	17 yrs.
	Furnace	Industrial	18 yrs.
	Turndown controls on Modulating Boiler	Commercial	15 yrs.
Heat Exchangers	Plate - Plate or Tube-Tube (COM)	Commercial	17 yrs.
	Plate - Plate or Tube-Tube (IND)	Industrial	
	Air -Air (COM)	Commercial	
	Air -Air (IND)	Industrial	
Insulation	Roof/Ceiling insulation	Industrial & Commercial	25 yrs.
	Pipe Insulation	Industrial & Commercial	14 yrs.
	Building Weatherization - Air sealing	Commercial	15 yrs.
	Building Envelope	Commercial	25 yrs.
	Tank Exterior Insulation	Industrial & Commercial	20 yrs.
	Low Temperature (less than 300°C)	Industrial	20 yrs.

Technology	Equipment Type	Sector	EUL
Ovens and Thermal oxidizers	Medium Temperature (300°C - 1000°C)	Industrial	20 yrs.
	High Temperature (>1000°C)	Industrial	20 yrs.
Process Controls	Electronic Loop Controllers	Industrial	20 yrs.
	PLC's	Industrial	20 yrs.
	Flame Supervision (relays)	Industrial	20 yrs.
Steam Distribution	Steam Traps	Industrial & Commercial	6 yrs.
	Steam Valve	Industrial Food Services	10 yrs.
Water Conditioners	Reverse Osmosis (RO)	Industrial	20 yrs.
	Ion Exchange	Industrial	20 yrs.
Industrial Equipment	All other industrial equipment	Industrial	20 yrs.
Water heating	High Extraction Washer	Commercial	10 yrs.
	Ice Resurfacing	Commercial	10 yrs.

AVOIDED COSTS

2021 Avoided Costs - EGD Rate Zone

Inflation Rate	2.00%
Discount Rate	6.08%

Table A	
Rate Class	% Subject to Carbon Charge
1	100.0%
6	96.3%
9	-
100	59.1%
110	74.2%
115	9.4%
125	0.0%
135	100.0%
145	75.0%
170	21.6%
200	0.0%
300	0.0%

Table B	
Market Segment for Forecasting	Weighted % Subject to Carbon Charge
Residential	100.0%
Commercial/Industrial	83.9%

Year	Gas Avoided Costs ($/m3) Baseload		Gas Avoided Costs ($/m3) Weather Sensitive		Avoided Carbon Costs ($/m3)		Water Avoided Costs ($/m3)		Electricity Avoided Costs ($/KWh)	
	Rate	NPV	Rate	NPV	Rate	NPV	Rate	NPV	Rate	NPV
2021	0.148	0.148	0.160	0.160	0.078	0.078	0.994	0.994	0.151	0.151
2022	0.178	0.316	0.197	0.346	0.098	0.171	1.014	1.950	0.154	0.296
2023	0.160	0.458	0.190	0.515	0.127	0.284	1.034	2.869	0.157	0.435
2024	0.152	0.585	0.182	0.668	0.157	0.415	1.055	3.753	0.160	0.569
2025	0.185	0.731	0.216	0.838	0.186	0.562	1.076	4.603	0.163	0.698
2026	0.187	0.870	0.219	1.002	0.216	0.722	1.098	5.420	0.167	0.822
2027	0.186	1.001	0.219	1.155	0.245	0.894	1.120	6.206	0.170	0.941
2028	0.203	1.135	0.236	1.312	0.274	1.076	1.142	6.962	0.173	1.056
2029	0.211	1.266	0.245	1.464	0.304	1.265	1.165	7.688	0.177	1.166
2030	0.220	1.395	0.255	1.614	0.333	1.461	1.188	8.387	0.180	1.272
2031	0.240	1.529	0.276	1.767	0.340	1.649	1.212	9.058	0.184	1.374
2032	0.253	1.661	0.290	1.918	0.347	1.830	1.236	9.704	0.188	1.472
2033	0.261	1.790	0.298	2.065	0.353	2.004	1.261	10.325	0.191	1.566
2034	0.282	1.921	0.320	2.213	0.361	2.172	1.286	10.922	0.195	1.657
2035	0.286	2.046	0.324	2.355	0.368	2.333	1.312	11.496	0.199	1.744
2036	0.275	2.159	0.314	2.485	0.375	2.487	1.338	12.048	0.203	1.828
2037	0.299	2.275	0.339	2.617	0.383	2.636	1.365	12.579	0.207	1.908
2038	0.332	2.397	0.372	2.753	0.390	2.779	1.392	13.090	0.211	1.985
2039	0.337	2.513	0.378	2.884	0.398	2.917	1.420	13.580	0.215	2.060
2040	0.340	2.624	0.382	3.008	0.406	3.049	1.448	14.052	0.220	2.131
2041	0.342	2.729	0.386	3.127	0.414	3.176	1.477	14.506	0.224	2.200
2042	0.328	2.824	0.372	3.235	0.422	3.299	1.507	14.942	0.229	2.267
2043	0.336	2.916	0.381	3.339	0.431	3.416	1.537	15.362	0.233	2.330
2044	0.366	3.010	0.412	3.445	0.440	3.529	1.568	15.765	0.238	2.391
2045	0.398	3.107	0.445	3.553	0.448	3.638	1.599	16.153	0.243	2.450
2046	0.413	3.201	0.461	3.658	0.457	3.743	1.631	16.526	0.247	2.507
2047	0.429	3.293	0.478	3.761	0.466	3.843	1.664	16.885	0.252	2.561
2048	0.445	3.384	0.495	3.862	0.476	3.940	1.697	17.229	0.257	2.613
2049	0.462	3.472	0.513	3.960	0.485	4.033	1.731	17.561	0.263	2.664
2050	0.480	3.559	0.532	4.056	0.495	4.122	1.766	17.880	0.268	2.712

Notes:

1. Avoided costs are provided in nominal dollars
2. For actuals, avoided carbon costs are weighted based on rate class (Table A) of the customer
3. For forecasting, avoided carbon costs are weighted based on market segment (Table B) of offering

2021 Avoided Costs - Union Rate Zones

Inflation Rate	2.00%
Discount Rate	6.08%

Table C	
Rate Class	% Subject to Carbon Charge
1	100.0%
10	98.0%
M1	100.0%
M2	93.2%
20	19.7%
25	13.8%
100	0.0%
M4	61.9%
M5	73.2%
M7	25.1%
M9	0.0%
M10	85.7%
T1	29.4%
T2	0.0%
T3	0.0%

Table D	
Market Segment for Forecasting	Weighted % Subject to Carbon Charge
Residential	100.0%
Commercial/Industrial	69.2%
Large Volume	0.0%

	Gas Avoided Costs ($/m3)				Avoided Carbon Costs ($/m3)		Water Avoided Costs ($/m3)		Electricity Avoided Costs ($/KWh)	
Year	Baseload		Weather Sensitive							
	Rate	NPV	Rate	NPV	Rate	NPV	Rate	NPV	Rate	NPV
2021	0.130	0.130	0.173	0.173	0.078	0.078	0.882	0.882	0.151	0.151
2022	0.127	0.249	0.176	0.339	0.098	0.171	0.899	1.730	0.154	0.296
2023	0.131	0.366	0.179	0.498	0.127	0.284	0.917	2.545	0.157	0.435
2024	0.122	0.468	0.171	0.641	0.157	0.415	0.936	3.329	0.160	0.569
2025	0.159	0.594	0.208	0.806	0.186	0.562	0.955	4.083	0.163	0.698
2026	0.165	0.717	0.216	0.966	0.216	0.722	0.974	4.808	0.167	0.822
2027	0.163	0.831	0.214	1.117	0.245	0.894	0.993	5.505	0.170	0.941
2028	0.182	0.951	0.234	1.272	0.274	1.076	1.013	6.175	0.173	1.056
2029	0.193	1.072	0.246	1.425	0.304	1.265	1.033	6.819	0.177	1.166
2030	0.198	1.188	0.253	1.574	0.333	1.461	1.054	7.439	0.180	1.272
2031	0.218	1.309	0.274	1.726	0.340	1.649	1.075	8.034	0.184	1.374
2032	0.234	1.432	0.291	1.878	0.347	1.830	1.096	8.607	0.188	1.472
2033	0.238	1.549	0.296	2.024	0.353	2.004	1.118	9.158	0.191	1.566
2034	0.259	1.669	0.319	2.172	0.361	2.172	1.141	9.688	0.195	1.657
2035	0.265	1.785	0.325	2.314	0.368	2.333	1.164	10.197	0.199	1.744
2036	0.250	1.888	0.311	2.442	0.375	2.487	1.187	10.687	0.203	1.828
2037	0.270	1.993	0.333	2.572	0.383	2.636	1.211	11.157	0.207	1.908
2038	0.306	2.105	0.370	2.707	0.390	2.779	1.235	11.610	0.211	1.985
2039	0.311	2.213	0.376	2.837	0.398	2.917	1.260	12.045	0.215	2.060
2040	0.312	2.314	0.379	2.961	0.406	3.049	1.285	12.464	0.220	2.131
2041	0.313	2.410	0.381	3.078	0.414	3.176	1.310	12.867	0.224	2.200
2042	0.295	2.496	0.364	3.183	0.422	3.299	1.337	13.253	0.229	2.267
2043	0.299	2.578	0.370	3.284	0.431	3.416	1.363	13.626	0.233	2.330
2044	0.329	2.662	0.401	3.387	0.440	3.529	1.391	13.983	0.238	2.391
2045	0.359	2.749	0.432	3.492	0.448	3.638	1.418	14.327	0.243	2.450
2046	0.371	2.834	0.446	3.594	0.457	3.743	1.447	14.658	0.247	2.507
2047	0.384	2.917	0.460	3.693	0.466	3.843	1.476	14.976	0.252	2.561
2048	0.397	2.998	0.475	3.790	0.476	3.940	1.505	15.282	0.257	2.613
2049	0.411	3.076	0.491	3.884	0.485	4.033	1.535	15.576	0.263	2.664
2050	0.425	3.153	0.507	3.975	0.495	4.122	1.566	15.859	0.268	2.712

Notes:
1. Avoided costs are provided in nominal dollars
2. For actuals, avoided carbon costs are weighted based on rate class (Table C) of the customer
3. For forecasting, avoided carbon costs are weighted based on market segment (Table D) of offering

Guidehouse

DSM Avoided Costs Study

Jurisdictional Review

Prepared for:

ENBRIDGE

Enbridge Gas Inc.

Submitted by:

Guidehouse Inc.
First Canadian Place,
100 King St W Suite 4950, Toronto, ON M5X 1B1, Canada
Telephone +1 416-777-2440

Reference No.: 217633

Date: April 20, 2021

Table of Contents

Disclaimers

This report was prepared by Guidehouse Inc. for Enbridge Gas Inc. The work presented in this report represents Guidehouse's professional judgment based on the information available at the time this report was prepared. Guidehouse is not responsible for the reader's use of, or reliance upon, the report, nor any decisions based on the report. GUIDEHOUSE MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESSED OR IMPLIED. Readers of the report are advised that they assume all liabilities incurred by them, or third parties, as a result of their reliance on the report, or the data, information, findings, and opinions contained in the report.

1. Introduction

Enbridge Gas Inc. engaged Guidehouse to review industry practices for demand side management avoided costs for four areas of focus. They are listed below, along with a high-level definition of each area:

1. Avoided Natural Gas Costs –
    a. Natural gas commodity costs – this is the basic cost of the gas commodity
    b. Natural gas delivery costs (including pipeline, storage, and peaking resources) – this is the cost related to delivery of the gas commodity to the end users; there is a seasonal component to these costs
    c. Demand reduction-induced price effects (DRIPE), also known as price effects – these are reductions in the wholesale price of the gas commodity based on structural changes in the market due to the load reduction caused by energy efficiency; although due to load reductions experienced by program participants, these effects are realized by all retail customers exposed to market prices and persist as long as the measures save energy because they impact the long term costs of gas development
2. Avoided Water Costs – these are the costs of water and, in some cases sewer, services avoided due to the reduced consumption of natural gas efficiency measures that also save water (for example, low-flow showerheads)
3. Avoided Carbon Costs – this is the value assigned to carbon or carbon dioxide no longer created due to reduced combustion of natural gas by gas energy efficiency measures
4. Avoided Infrastructure Costs – this the avoided costs of capital investments in infrastructure capacity (pipelines, compressors, etc.) not needed because reduced peak demand for natural gas enables existing infrastructure capacity to meet the peak needs.

This report provides a clear summary of the review of avoided cost practices that have been adopted in the following jurisdictions:

- California
- Colorado
- Illinois
- Massachusetts
- Michigan
- Minnesota
- New York

- Vermont
- Wisconsin

1.1 Key Findings

- Avoided natural gas costs can include the value of natural gas commodity supply that is avoided through investments in energy efficiency, the avoided costs of delivery of that supply, and, in limited situations, the value of demand reduction induced price effects (DRIPE), i.e., the effects on energy prices resulting from decreased demand. Avoided natural gas cost refers to the value of avoiding the purchase of natural gas resulting from investments in energy efficiency. Avoided natural gas delivery costs refers to avoided embedded costs of pipeline, storage and peaking resources that deliver natural gas to the distribution system. Natural gas commodity costs are included in all of the jurisdictions that were reviewed. In most cases, the natural gas avoided commodity costs are calculated using a reference price forecast prepared by an independent third party or by using the NYMEX forward prices. If the Henry Hub index price is used, natural gas prices are adjusted to reflect regional prices (i.e., the cost of natural gas in the jurisdiction under consideration. In most cases, the natural gas delivery costs (i.e., transportation costs) are included. Among the jurisdictions reviewed as identified below Table 1-1, price effects such as DRIPE are only included in Massachusetts.

- Avoided water costs refers to the costs and benefits associated with changes in water consumption and wastewater treatment resulting from efficiency resources (e.g., from a high-performing washing machine or reduced energy consumption). Among the reviewed jurisdictions, only California, Michigan, Minnesota, and New York do not include avoided water costs. Water costs are calculated using local water and sewer rates.

- Avoided carbon costs refers to the environmental costs and benefits with reduced greenhouse gas emissions that result from energy efficiency. Carbon costs vary widely across selected jurisdictions, and may be based on regional carbon pricing initiatives, cap and trade systems or other methods.

- Avoided infrastructure costs refers to the costs and benefits associated with changes in natural gas consumption enable delays in the timing of new projects, or reductions in the size of these projects. Infrastructure costs are not considered in avoided DSM costs in most comparator jurisdictions. Vermont, Massachusetts, and California include some provisions for avoided infrastructure costs. New York includes avoided gas infrastructure costs for non-pipes alternative projects.

- Guidehouse observes that, across the examined jurisdictions, there is not a great level of consistency across the reviewed jurisdictions on avoided costs. For example, while all jurisdictions include avoided natural gas commodity costs and use a similar process to calculate the avoided commodity cost, treatment of natural gas delivery costs is not consistent. In fact, no two jurisdictions use the same approach for avoided natural gas delivery costs and only Massachusetts includes price effects (DRIPE). Avoided carbon costs is a second category where all but one jurisdiction, Michigan, include avoided carbon costs, but there is not significant consistency in the carbon price assumption that is used. Lastly, the avoided infrastructure category provides another example of inconsistency in approaches across different jurisdictions. California and Colorado are two jurisdictions that include avoided infrastructure costs while in New York, where avoided infrastructure costs are allowed, but not always included. Avoided infrastructure costs are included in Vermont by applying a discount to the price of demand side resources to account for the risk of gas supply price volatility and potentially unnecessary infrastructure investment.

Table 1-1. Summary of Major Findings

Utility / Jurisdiction	Natural Gas	Water	Carbon	Infrastructure
California	Commodity cost included Delivery costs included Price effects not included	Not included	Included. Most recent auction ~$18/ton	Avoided infrastructure costs are included
Colorado	Commodity Cost included Delivery cost not included Price effects not included	Included	Included but assumed to be zero	Included
Illinois	Commodity cost included Delivery costs included Price effects not included	Included	Included. Uses U.S. Energy Information Agency as source of carbon value	Not Included
Massachusetts	Commodity cost included Delivery costs not included Price effects included	Included associated with efficiency measures	Included	Included as avoidable retail margin
Michigan	Commodity cost included Delivery costs not included Price effects not included	Not Included	Not Included	Not Included
Minnesota	Commodity cost included	Not included	Carbon, and other emissions included in BENCOST. 2020	

Utility / Jurisdiction	Natural Gas	Water	Carbon	Infrastructure
	Delivery costs included Price effects not included		value of carbon $25.76/ton	Gas infrastructure not explicitly included
New York	Commodity cost included Delivery costs included Price effects not included	Not explicitly included	Included, Social Cost of Carbon	Allowed for but not always included
Vermont	Commodity cost included Delivery costs included Price effects not included	Included in total resource benefit calculation	Avoided cost of carbon estimated at $100/ton	10% discount to price of Demand side resources due in part to infrastructure risk
Wisconsin	Commodity cost included Delivery costs not included Price effects not included	Included	Included Estimated Cost is $15/ton	Not included

1.2 Methodology

Guidehouse reviewed the approaches to avoided costs for natural gas, water, carbon emissions and infrastructure by reviewing publicly available documents including state legislation and utility demand side management reports in the following jurisdictions:

- California
- Colorado
- Illinois
- Massachusetts
- Michigan
- Minnesota
- New York
- Vermont
- Wisconsin

2. California

2.1 Natural gas

California includes avoided commodity costs and delivery costs. Price effects are not included. The natural gas avoided commodity costs (ACC) used in cost effectiveness tests for demand side management investments are based on:

- Natural gas forward prices, which are based on NYMEX Henry Hub prices plus Delivery to Northern and Southern California using NYMEX basis swaps for PG&E Citygate and the Southern California Border.
- Forward based prices for 5 years and then transition to the CEC IEPR mid gas price forecast that is used in the California Public Utilities Commission (CPUC) Integrated Resource Plan (IRP).

The ACC natural gas price forecasts are developed using forward prices for five years, then transition to the California Energy Commission IEPR mid gas price forecast, which is currently used in the IRP proceeding over a three-year transition phase.[1]

Natural gas transmission and distribution (T&D) benefit: These costs represent an estimate of marginal transportation cost for delivering gas to “core” residential and commercial end-users. This cost is not the same as the embedded cost of gas delivery the distribution company charges non-core customers. Marginal gas transmission cost is not based on peak throughput, but rather the average delivery cost per therm based on the usage profile for each class. The T&D allocation assigns the natural gas capacity cost to the winter season based on the volumetric throughput on each utility system. No T&D capacity costs are assigned to the summer months when gas volumes are lower.

2.2 Water

California does not include avoided water costs in demand side management cost effectiveness tests.

2.3 Carbon

In 2020, California updated its approach to its avoided greenhouse gas (GHG) cost calculation to reflect the total cost that will be incurred from emissions, including both cap and trade allowance prices and the additional electric sector supply costs for delivered renewable energy needed to meet the GHG goals[2].

The revised GHG avoided cost calculation is comprised of two cost streams:

1. Cap and Trade allowance prices

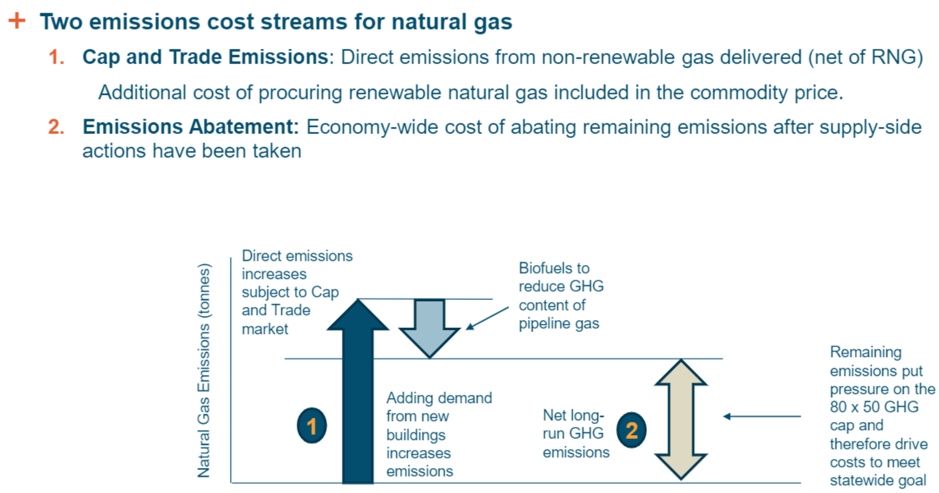
[1] *https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M340/K054/340054558.PDF*

[2] *https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M334/K786/334786698.pdf*

2. An estimate of the additional electric sector supply costs for delivered renewable energy to meet CA GHG goals

The figure below illustrates the treatment of carbon costs in California.

Figure 1. Avoided Natural Gas Carbon Costs in California



2.4 Infrastructure

California defines avoided infrastructure costs as the cost of constructing additional T&D capacity to meet customer peak demands growth. Costs are based on utility capital and load forecasts in filings with the CPUC and FERC.[3]

- For electricity, the T&D capacity avoided costs vary by sub-area within the utilities. Capacity costs also vary by hour, coincident with the timing of the local area peak demands. Peak demand is correlated to local weather conditions.
- For natural gas, the T&D avoided costs vary by utility service territory and are allocated to the winter season (November through March)

[3] https://www.aceee.org/files/proceedings/2004/data/papers/SS04_Panel5_Paper20.pdf

3. Colorado

3.1 Natural gas

Colorado includes avoided commodity costs and delivery costs. Price effects are not included. The gas price forecast reflects a market snapshot for short-term prices and a quantitative average of projections from well-known forecasting services for the long-term forecast prices as of January 2020. Distinct costs are identified for business and residential customers with these values being applied to business and residential gas programs, respectively.[4]

Figure 2. XCEL Energy Natural Gas Avoided Costs

	$/Dth			$/Dth	
Year	Residential	Business	Year	Residential	Business
2021	$2.33	$2.30	2032	$3.74	$3.71
2022	$2.17	$2.14	2033	$3.87	$3.84
2023	$2.32	$2.31	2034	$4.01	$3.98
2024	$2.38	$2.36	2035	$4.22	$4.19
2025	$2.57	$2.55	2036	$4.35	$4.32
2026	$2.76	$2.73	2037	$4.55	$4.52
2027	$2.95	$2.93	2038	$4.73	$4.70
2028	$3.10	$3.07	2039	$4.91	$4.89
2029	$3.26	$3.24	2040	$5.07	$5.04
2030	$3.44	$3.41	2041	$5.32	$5.28
2031	$3.60	$3.57			

Estimated Annual Avoided Reservation Costs (used to estimate capacity savings – Peak Day Dth savings estimated as 1% of annual Dth savings) (Source: Public Service Gas Resource Planning)

The following annual avoided reservation costs are used to determine the cost of service to transport incremental gas supplies to the metropolitan Denver area. The Company uses the CIG firm transportation rate (Colorado Interstate Pipeline tariff) to estimate this cost. Year $/Dth 2019-2039 $35.022[5]

[4] *https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/CO-DSM/CO_2021-22_DSM_Plan_Final.pdf*

[5] *https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/CO-DSM/CO_2021-22_DSM_Plan_Final.pdf*

3.2 Water

Avoided water savings that accrue from programs are calculated using the following rates:

- Water Rate $2.69/1,000 gallons
- Sewer Rate $4.34/1,000 gallons

3.3 Carbon

Public Services Company of Colorado's 2016 Electric Resource Plan (Proceeding No. 16A0396E) used a base-case assumed zero cost for CO_2 emissions. For this reason, this value is set to $0 for all future years.[6]

The Company has also used the Social Cost of Carbon pursuant to the language in Senate Bill 19-236, codified at §40-3.2-106(c)(4), C.R.S. to conduct sensitivity cost-benefit analysis at the portfolio level.

3.4 Infrastructure

Guidehouse could not find any information related to avoided infrastructure costs for natural gas demand side management avoided costs.

[6] *https://leg.colorado.gov/sites/default/files/documents/2019A/bills/2019a_236_enr.pdf*

4. Illinois

Northern Illinois Gas Company ("Nicor Gas") in its petition for approval of its proposed Energy Efficiency Plan ("EEP" or "Plan") for January 1, 2018 through December 31, 2021 ("EEP 2018-2021") outlined its proposed benefits calculation. Its proposal includes quantifiable benefits, such as reductions in water consumption and carbon emissions and, further, an adder to quantify non-energy benefits.

4.1 Natural gas

Illinois includes avoided commodity costs and delivery costs. Price effects are not included. The primary benefits are the avoided costs of natural gas supplies as a result of the energy savings generated by the measures installed by program participants. These benefits are forecast over the lifetime of the measures installed.

Nicor Gas developed an Avoided Cost Model that includes the costs avoided in purchasing the natural gas commodity, as well as the greenhouse gas and other societal benefits required by Section 8-104(b) of the Public Utilities Act. The Avoided Cost Model includes the following components, each described in more detail: gas commodity price, gas supply cost adjustment, pipeline delivery charge, demand related distribution cost, volume related distribution cost, state tax, a heating season differential, a greenhouse gas cost adder, and an additional quantifiable benefit adder.[7] Total Avoided Cost begins at $0.54 per therm in 2018 and reaches $2.16 per therm in 2053.

There are three commodity-related components:

- Nicor Gas includes commodity prices at Henry Hub, using a forecast from the August 2016 Wood Mackenzie report, *Wood Mackenzie Natural Gas Forecast, Long Term View*[8] which extends through the year 2035. To extrapolate the Wood Mackenzie data beyond this price forecast, Nicor Gas applied trends from the U.S. Energy Information Administration ("EIA") commodity price forecast from its 2016 Annual Energy Outlook ("AEO"). This longer price forecast allows Nicor Gas to analyze measures with longer measure lives.

- A gas supply cost adjustment accounts for the difference between the commodity price Nicor Gas pays and the price of natural gas at Henry Hub described above.

- A heating season differential adder applies a higher price to winter-only measures to account for higher natural gas commodity prices in the winter months. To develop this adder, Nicor Gas uses the August 2016 Wood Mackenzie Report to compare seasonally weighted winter prices to annual average prices. Winter price premiums used in the analysis ranged between $0.027 per therm and $0.036 per therm.

There are two delivery-related components to the natural gas avoided costs:

[7] Application pursuant to Section 8-104 of the Public Utilities Act for Consent to and Approval of an Energy Efficiency Plan (Docket 17-0310); Exhibits 2.0 and 2.1, *https://www.icc.illinois.gov/docket/P2017-0310/documents/254586/files/449573.pdf*

[8] This report appears to be available by subscription only.

- The pipeline delivery charge represents the cost to bring the natural gas commodity to Nicor Gas' distribution system.

- A demand and volume related distribution cost adjustment accounts for the volumetric costs that Nicor Gas incurs to deliver gas on the distribution system. To develop these components, Nicor Gas uses the demand and volume distribution costs from Nicor Gas' Embedded Cost of Service Study from Docket No. 08-0363, and then converts them to $/therm units for the use in the Avoided Cost Model.

The Table below, from "Nicor Gas Energy Efficiency Plan, June 2017 - May 2020[9]" shows the calculation of 2018 avoided costs.

Gas Charge	Cost ($/Therm)
Natural Gas Commodity Price Forecast @ Henry Hub	0.3587
Pipeline Delivery & Gas Supply	0.0903
Demand, Volume & State Tax	0.0638
Greenhouse Gas*	0.0000
Additional Quantifiable Benefits	0.0385
Total	**$0.5512**
* The Greenhouse gas adder is applied from 2020.	

In addition to the commodity and delivery components, as noted in the table, Nicor Gas includes state tax, greenhouse gas value, and additional quantifiable benefits in the Avoided Cost Model.[10] The state tax reflects the tax customers pay on their Nicor Gas bill. Rider 8 (Adjustments for Municipal, Local Governmental Unit and State Utility Taxes) displays the state tax, which is defined in $/therm units and is levied on gross receipts. The current tax rate is approximately 5.15%[11]. Additional quantifiable benefits adder consists of a 7.5% increase to the Avoided Cost, consistent with the approach used by MidAmerican Energy Company in the energy efficiency plans approved by the Illinois Commerce Commission (the "Commission") in Docket Nos. 08-0108 and 12-0132. The greenhouse gas benefit value is described below.

Certain components are also adjusted for inflation beginning in 2018 and adjusted each year after 2018. These components that are adjusted for inflation are the pipeline delivery charge, the gas supply cost adjustment, and the demand and volume related distribution charges. Nicor Gas uses a 2% annual inflation rate, which is based upon the annual escalation from the Consumer Price Index in the August 2016 Wood Mackenzie report.

Price effects are not counted by Nicor in the calculation of avoided natural gas costs.

[9] *https://www.icc.illinois.gov/docket/P2016-0421/documents/245522/files/433226.pdf*

[10] This is the only instance among those companies surveyed of the mention of avoidable state taxes. However, not all jurisdictions tax utility bills; Guidehouse did not research sample bills for the surveyed states.

[11] *https://www.nicorgas.com/content/dam/southern-co-gas/rates-and-riders/2021-rates-and-riders/march-2021-rates-and-riders/Nicor_Rider_8_info.pdf*

4.2 Water

Nicor Gas constructed an index of municipal water rates for the 22 largest municipalities in the service territory. In the Nicor Gas service territory the cost of water for participants is $4.40 per 1,000 gallons in 2013, using a weighted average by population. Throughout the period of the forecast, the water rate index is inflated at 4.78% per year based on historic inflation for water utilities tracked by the U.S. Department of Labor.

4.3 Carbon

A greenhouse gas adder is included in the Avoided Cost Model. To develop the adder, Nicor Gas uses the EIA cost of carbon from its 2014 Annual Energy Outlook report and converts this cost of carbon from units of $/metric ton to $/therm. The adder is included in the avoided cost beginning in 2020, as a result of the agreement with stakeholders.

4.4 Infrastructure

There is no mention of avoidable infrastructure costs in Nicor's presentation of avoided costs of natural gas.

5. Massachusetts

Avoided natural gas costs in Massachusetts include avoided natural gas commodity costs and avoided delivery costs. In addition, Massachusetts is the only reviewed jurisdiction to include the price effects of demand reduction (DRIPE). Massachusetts' guidelines for what is included in its total resource cost (TRC) benefit cost test are set by the state's Department of Public Utilities (DPU). The Guidelines were last updated in 2013 in Docket 11-120-A[12] and are currently under review in Docket 20-150. Avoided costs for natural gas and carbon are determined by the regional Avoided Energy Supply Component (AESC) study, updated most recently in March 2021.[13] last completed in 2018 and due to be updated in a final report in spring 2021.

- Natural gas commodity value determined from AESC; delivery and peak supply costs are factored into commodity value. Price effects (DRIPE) are also determined from AESC, including cross-fuel effects.
- Water value determined from database of water and sewer rates
- Carbon value from social damage cost of carbon, net of values embedded in avoided energy values from participation in Regional Greenhouse Gas Initiative
- DPU Guidelines allow for avoided gas distribution benefits but these are not currently monetized by utilities

5.1 Natural gas

The natural gas avoided cost is an "all-in" cost that includes both variable costs and avoidable fixed costs. The avoided costs are calculated at the citygate, without LDC distribution costs, and at the customer meter, with the avoidable portion of the retail distribution margin included.

Avoided commodity costs developed for Southern New England based on NYMEX commodity price forecast for Henry Hub for two years, then uses the US EIA Annual Energy Outlook forecast beyond that. Sensitivity cases are developed for high and low-price cases, but the reference case is almost always used.

The study uses regressions of historical prices to determine which set of price hubs provide the best source for determining marginal gas supply sources (from among pipeline sources and LNG terminals) for each New England region at citygate for determining future estimates of basis costs.

Overall avoided costs are converted to eight retail end uses value streams: for residential sector - non-heating, heating, hot water, and all residential; for commercial - heating, non-heating, and all end uses; and all retail end uses. The avoided cost for each end-use type is calculated as a weighted average of the marginal resource costs over the applicable costing periods. To use these values, program administrators need to when savings occur by measure and to match them to the appropriate stream of avoided costs.

[12] https://www.mass.gov/files/2017-06/DPU%2011-120-A%20Phase%20II_0.pdf

[13] The methodology for avoided cost development is the same in AESC2021 and AESC 2018, with the exception of the development of natural gas supply DRIPE as described.

Avoided costs to reflect peaking natural gas demand are not developed separately. The development of marginal sources for various times of year and geographic locations are intended to capture peaking costs.

Demand reduction induced price effects (DRIPE) for natural gas has two components: a supply component and a transportation or basis component determined from contract prices. In AESC2021, gas supply DRIPE is based on an analysis of natural gas supply price changes in different scenarios in EIA's 2021 Annual Energy Outlook and captures the effect of changing gas demand on gas price; in AESC2018, the supply component was calculated from price elasticity of supply for wholesale gas commodity and production costs.[14] The value of DRIPE from analysis of the regional market is then apportioned to each state based on projections of demand. Because some gas in the market is tied up in short terms contracts, it will not be affected by DRIPE. Over the lifetime of measures, as contracts expire, eventually 100% of the gas in the market is impacted by DRIPE. In addition, an additional gas-to-electric DRIPE component estimates the benefits to electricity consumers from a reduction in gas demand where gas-fired generation is on the margin. This is determined from an analysis of supply and basis price movements and a conversion to $/MMBtu using assumed heat rates and amount of electricity in the spot market.

5.2 Water

Per DPU Guidelines, "Non-gas benefits shall account for those benefits that are specific to Program Participants, and shall be comprised of the following: (i) Resource benefits, which account for the avoided costs of electric, oil, water, sewage disposal, and other resources for which consumption is reduced as a result of the implementation of an Energy Efficiency Program. Resource benefits shall be calculated as the product of: (A) the reduction in consumption of the identified resource; and (B) the avoided cost factor for each resource."

Utilities develop service territory specific rates for water and sewage by accessing a statewide database of published rates and averaging the rates for the towns that fall within its territory. In the absence of a forecast of water and sewer rates, these values are generally assumed to be constant over the lifetime of the benefit cost analysis.

5.3 Carbon

Per DPU Guidelines, "avoided gas and distribution cost factors shall include distribution-related environmental compliance costs that are reasonably projected to be incurred in the future because of state or federal laws, rules and/or regulatory requirements that are currently in effect or are projected to take effect in the future."

Currently, the AESC Study develops a social damage cost for carbon in $/ton from a literature survey. Carbon allowance prices from the Regional Greenhouse Gas Initiative are netted out from these costs, and the remainder is converted to $/therm

Pending legislation in Massachusetts would mandate that the social cost of carbon be used in benefit cost calculations.

[14] The basis component is determined from contract prices and the balance of supply and demand – mostly from pipelines – on a daily or regional basis. This is only used for electric energy efficiency BCA and not gas BCA because most LDCs have firm long-term contracts; as a result, basis DRIPE only impacts electric customers.

5.4 Infrastructure

Per DPU Guidelines, gas benefits include "Avoided distribution benefits, calculated as the product of: (A) an Energy Efficiency Program's gas commodity savings; and (B) an avoided distribution cost factor. The avoided distribution cost factor shall be based on the distribution costs specific to each gas Distribution Company."

The avoidable retail margin captures avoided distribution infrastructure costs. It is determined from an analysis of the relationship between expenditures on plant and O&M and changes in peak day demand from recent marginal cost studies in New England. A weighted average of 7 values was used to determine the avoidable retail margin. The value is calculated on a per MMBtu basis and rolled into the avoided natural gas commodity values.[15]

The table on the next page shows the avoided costs used for calculating the benefit cost ratios of National Grid's Massachusetts Natural Gas Programs in its year end 2019 filing in May 2020.[16] These avoided costs are based on the 2018 AESC Study and National Grid's Water Cost Survey; avoided costs are in 2019 dollars.

[15] AESC2021 presents commodity values both with and without the retail margin to account for differing practices across jurisdictions in counting this benefit.

[16] "NationalGrid(gas)Screening2019Model.xlsm," https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/12188284

Years		Natural Gas ($/MMBtu)							Gas DRIPE ($/MMBtu)	Gas to Electric Cross DRIPE ($/MMBtu)							Natural Gas Environmental Compliance Cost ($/MMBtu)		Water ($/Gallon)	
		Res Non Heating	Res Hot Water	Res Heating	Res All	C&I Gas Non Heating	C&I Gas Heat	C&I Gas All	Gas Supply	Res Non-Heating	Res Hot Water	Res Heating	Res All	C&I Non-Heating	C&I Heating	C&I All	Residential	Commercial	Res Water	C&I Water
ANNUAL AVOIDED COSTS																				
1	2019	4.59	6.48	7.83	7.20	5.47	6.95	6.30	0.02	1.97	1.97	3.65	3.06	1.97	3.65	2.91	4.05	4.05	0.02	0.02
2	2020	5.51	7.26	8.56	7.97	6.33	7.71	7.11	0.03	2.17	2.17	4.02	3.37	2.17	4.02	3.21	4.05	4.05	0.02	0.02
3	2021	6.44	8.20	9.50	8.91	7.27	8.66	8.05	0.04	2.19	2.19	4.04	3.40	2.19	4.04	3.23	4.05	4.05	0.02	0.02
4	2022	6.38	8.12	9.42	8.83	7.20	8.58	7.97	0.04	1.98	1.98	3.66	3.07	1.98	3.66	2.92	4.05	4.05	0.02	0.02
5	2023	6.39	8.12	9.42	8.83	7.21	8.58	7.98	0.04	1.19	1.19	2.19	1.84	1.19	2.19	1.75	4.05	4.05	0.02	0.02
6	2024	6.48	8.20	9.50	8.91	7.29	8.66	8.06	0.04	0.76	0.76	1.39	1.17	0.76	1.39	1.11	4.05	4.05	0.02	0.02
7	2025	6.50	8.21	9.51	8.92	7.31	8.67	8.08	0.04	0.56	0.56	1.00	0.84	0.56	1.00	0.81	4.05	4.05	0.02	0.02
8	2026	6.57	8.28	9.58	8.99	7.38	8.74	8.15	0.04	0.38	0.38	0.64	0.55	0.38	0.64	0.53	4.05	4.05	0.02	0.02
9	2027	6.61	8.31	9.60	9.02	7.41	8.77	8.18	0.04	0.20	0.20	0.33	0.28	0.20	0.33	0.27	4.05	4.05	0.02	0.02
10	2028	6.73	8.43	9.72	9.14	7.53	8.88	8.29	0.04	0.04	0.04	0.02	0.03	0.04	0.02	0.03	4.05	4.05	0.02	0.02
11	2029	6.84	8.53	9.81	9.24	7.64	8.98	8.40	0.04	0.04	0.04	0.02	0.03	0.04	0.02	0.03	4.05	4.05	0.02	0.02
12	2030	6.90	8.58	9.87	9.29	7.70	9.04	8.45	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
13	2031	7.06	8.74	10.02	9.45	7.86	9.19	8.61	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
14	2032	7.08	8.74	10.03	9.45	7.87	9.20	8.62	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
15	2033	7.02	8.68	9.96	9.39	7.81	9.14	8.56	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
16	2034	6.93	8.58	9.86	9.29	7.71	9.04	8.46	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
17	2035	6.96	8.60	9.87	9.31	7.74	9.06	8.48	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
18	2036	7.00	8.63	9.90	9.34	7.77	9.09	8.51	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
19	2037	7.04	8.66	9.93	9.37	7.81	9.12	8.55	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
20	2038	7.08	8.70	9.96	9.40	7.85	9.15	8.58	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
21	2039	7.12	8.73	9.99	9.43	7.88	9.19	8.62	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
22	2040	7.16	8.76	10.03	9.47	7.92	9.22	8.65	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
23	2041	7.20	8.79	10.06	9.50	7.96	9.25	8.69	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
24	2042	7.24	8.83	10.09	9.53	8.00	9.28	8.72	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
25	2043	7.28	8.86	10.12	9.56	8.03	9.32	8.76	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
26	2044	7.32	8.89	10.15	9.60	8.07	9.35	8.79	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
27	2045	7.36	8.93	10.18	9.63	8.11	9.38	8.83	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
28	2046	7.41	8.96	10.21	9.66	8.15	9.42	8.86	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
29	2047	7.45	8.99	10.24	9.70	8.19	9.45	8.90	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
30	2048	7.49	9.03	10.27	9.73	8.23	9.48	8.93	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
31	2049	7.53	9.06	10.30	9.76	8.26	9.52	8.97	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02
32	2050	7.57	9.10	10.34	9.80	8.30	9.55	9.01	0.04	-	-	-	-	-	-	-	4.05	4.05	0.02	0.02

6. Michigan

Michigan employs a utility system resource cost test, otherwise known as a program administrator cost test or utility cost test (UCT). The UCT is used to determine the standard that must be met for an investment in demand side management. The test assess the total avoided supply-side costs to the provider, including representative values for electricity or natural gas supply, transmission, distribution, and other associated costs. These avoided costs must be greater than the total costs to the provider of administering and delivering the energy waste reduction program, including net costs for any provider incentives paid by customers and capitalized costs that are recovered.[17]

The UCT is limited in the amount of avoided costs it allows, relative to other commonly-used cost-effectiveness tests.[18]

Figure 3. Benefits and Costs by Cost-Effectiveness Test

Benefits and Costs by Cost-Effectiveness Test

	PCT	RIM	TRC	SCT	UCT
Benefits					
Primary Fuel(s) Avoided Supply Costs		✓	✓	✓	✓
Secondary Fuel(s) Avoided Supply Costs			✓	✓	
Primary Fuel(s) Bill Savings (retail prices)	✓				
Secondary Fuel(s) Bill Savings (retail prices)	✓				
Other Resource Savings (e.g. water)	✓		✓	✓	
Environmental Benefits				✓	
Other non-energy benefits			✓	✓	
Costs					
Program Administration		✓	✓	✓	✓
Program Financial Incentives		✓	✓	✓	✓
Customer Contributions	✓		✓	✓	
Utility Lost Revenues		✓			

✓ -included in the test ✓ - rarely included or in theory only

6.1 Natural gas

Michigan includes avoided commodity costs and delivery costs. Price effects are not included. Primary fuel avoided costs are included in the UCT. DTE Gas has indicated that both commodity and non-commodity costs of energy are incorporated in cost tests for energy waste reduction programs.[19]

6.2 Water

Water is not included as an avoided cost in the UCT employed in Michigan.

---

[17] *https://www.legislature.mi.gov/documents/2015-2016/publicact/htm/2016-PA-0342.htm*

[18]https://www.michigan.gov/documents/energy/Energy_Efficiency_Question_14_response_from_DTE_Consumers_and_MEGA_418935_7.pdf

[19] https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t000000D49FBAAZ

6.3 Carbon

Environmental benefits are not included as an avoided cost in the UCT employed in Michigan. Avoided carbon tax costs are included in screening for renewable energy programs, but are not included in cost-effectiveness tests for energy efficiency programs.[20]

6.4 Infrastructure

Avoided infrastructure costs are not included as avoided costs in the UCT employed in Michigan.

[20] https://www.synapse-energy.com/sites/default/files/Appendix%20D%20from%20Michigan%20Report.pdf

7. Minnesota

The Minnesota Department of Commerce updated the allowable avoided cost inputs for natural gas DSM carried out by investor owned utilities (IOUs) in the state in its 2021-2023 Cost Effectiveness Review. Three of the four focus areas are included in avoided costs, with only water being excluded from the calculation.[21]

7.1 Natural gas

Minnesota includes avoided commodity costs and delivery costs. Price effects are not included. Natural gas commodity costs are included as inputs to the natural gas IOU BENCOST (Benefit Cost) calculations.

The Retail Rate ($/Dth): the natural gas rate for the specific customer class or classes (i.e., commercial, industrial, or residential) that are expected to participate in the project. The retail rate is the sum of the following:

- The utility's currently approved tariffed non-natural gas margin in the customer class that is expected to participate in a project (or a weighted average non-natural gas margin if more than one customer class is expected to participate in the project), which is on file with the Department of Commerce

- The commodity Cost of $3.25/Dth.

- The utility's per Dth Demand Cost, i.e. the estimated annual fixed demand cost that the utility would save from buying one fewer Dth of demand services.

The Peak Reduction Factor (1 percent): The estimated average annual effect of the project on system peak. The factor is presented as the percent of energy savings occurring on peak, which is estimated at one percent for most projects.

- The value in Minnesota for 2021-2023 is set at 1%, the same value that was used in 2017-2019.

Variable O&M ($/Dth): The variable costs, other than fuel and purchased energy costs, that are included as expenses in delivering energy to the end use consumer. For utilities that have flexible rate tariffs, Variable O&M is the minimum transportation flexible rate, which is generally based on the utility's best estimate of variable costs. Each utility must fully explain how it determines the Variable O&M input.

7.2 Water

Water is not an allowed avoided cost in IOU BENCOST calculations in Minnesota.

7.3 Carbon

The Gas Environmental Damage Factor ($2.07/Dth): The long-term "external" cost to society and the environment of burning natural gas. The factor is calculated using the median range of

[21] *https://drive.google.com/file/d/1kDbRJNN1XwMUAj4xjT2AZgehOn8bZ4Ll/view*,

the final metropolitan fringe environmental cost values approved by the Minnesota Public Utilities Commission (Commission) for carbon dioxide (CO2), sulfur dioxide (SO2), fine particulate matter (PM2.5), carbon monoxide (CO), nitrogen oxides (NOx), and lead (Pb); along with estimated natural gas emission factor (or factors) for each emission provided by the Environmental Protection Agency.

For CO2, Minnesota uses a median value of $25.76/ton in 2020 from the Commerce Department's January 3, 2018 Order Updating Environmental Cost Values. The Gas Environmental Damage Factor is reported in 2020 dollars and is escalated using an Annual Escalation Rate of 2.3 percent. The escalation rate was calculated by applying an exponential fit to a projected price index (for the period 2020 through 2048) entitled "Chained Price Index-Gross Domestic Product,".

7.4 Infrastructure

Minnesota does not include specific avoided costs for infrastructure investments.

8. New York

Avoided natural gas costs in New York include avoided natural gas commodity costs and avoided delivery costs. New York does not count price effects as a benefit. Benefits streams for avoided costs in New York are defined by New York Public Service Commission Guidance issued in 2016[22]. Under this guidance, each program administrator provides a proposed set of avoided costs to accompany its energy efficiency program filings. Some of the values are defined by the regulator, while others are defined by the utility. In this section, Guidehouse uses a review of Con Edison 2020 benefit cost handbook[23] and National Grid filings as examples. Note that the Con Edison proposal is pending before the New York regulatory agencies.

Natural gas benefits include off-system purchase of natural gas upstream of the company's city gates, commodity purchases at the city gate, and on-system supply sources (e.g. CNG). On-system LNG is excluded from the Gas BCA framework.

Upstream supply resources generally have two key cost components:

- Commodity Costs or variable expenses associated with the delivery of actual physical commodity, generally on an as required basis
- Fixed Costs, such as for pipeline demand charges or fixed demand fees, associated with securing the right to supply at the city-gate.

8.1 Natural gas

The commodity cost is the projected wholesale cost of gas at the city-gate (based on the applicable avoided upstream supply resource and the cost of transportation to the city gate, if any). There could be time differentiation of the commodity cost – it could be peak, seasonal, or end-use oriented, or another time interval. The supply resource could include firm contractual rights to interstate pipeline capacity that include a fixed annual cost (i.e., the underlying demand charge associated with the contract), the cost of firm supply at the city-gate based on the cost of commodity at the applicable upstream supply point (e.g., Gulf supplies or Appalachian basins) plus a small additional fee associated with the pipeline's variable shipping costs and fuel expenses. Alternatively, the utility may acquire Delivered Services from a third-party directly at the interstate city-gate.

Peaking Services are currently considered the marginal source of supply during peak days. Peaking Services costs include: (1) a fixed reservation fee for the right to call upon the supply and (2) a variable commodity charge for when the utility does call upon the supply. The benefits associated with avoided Peaking Services include the fixed reservation fee component and the variable commodity charge component. For these contracts, the avoidable fixed cost is the associated reservation fee, measured in $/Dth/duration of service. The Weighted Average Cost of Peaking Services (WACOPS) is the fixed reservation fee component of the avoidable Peaking Services supply under the applicable scenario, measured in $/Dth/duration of service.

[22] ORDER ESTABLISHING THE BENEFIT COST ANALYSIS FRAMEWORK (2016), *http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={F8C835E1-EDB5-47FF-BD78-73EB5B3B177A}*

[23] Gas Benefit-Cost Analysis Handbook, September 14, 2020, *http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={2CCB0D2A-183A-483B-9F56-87878E0471FA}*

The commodity component, associated with the physical molecules of natural gas that are delivered to the city-gate, is part of the commodity cost.

Avoided pipeline and storage costs are associated with avoiding financial commitments to maintaining contractual rights to off-system pipeline and storage capacity. The avoided cost of pipeline and storage, evaluated on a $/Dth/day basis, are only available as benefit streams after peak demand has been reduced such that the need for Peaking Services is eliminated. These generally consist of fixed costs (e.g. reservation fees) and associated avoided variable costs (e.g., volumetric charges for the costs associated with physical delivery of natural gas to the city-gate).

Natural gas price effects are considered a transfer payment in New York and are not enumerated as a benefit.

8.2 Water

A category of “Other External Benefits” includes external benefits, such as land or water benefits associated with a project or program. Thus far, we have not found evidence that these are actually being valued in benefit cost analyses.

8.3 Carbon

Avoided CO2 Emissions are attributed to a net reduction in natural gas use or replacement of gas consumed with Renewable Natural Gas (where CO2 emissions are reduced via the creation of the fuel). Avoided CO2 Emissions can be calculated based on the Social Cost of CO2. This is an estimate of the total impacts to society associated with an incremental increase in carbon dioxide emissions, measured in dollars per ton of CO2 equivalent. The Social Cost of CO2 can be based on separate studies, published government sources, or on market indicators. One market indicator would be Renewable Energy Certificates (RECs). REC carbon allowances are priced in the form of $/kWh. This $/kWh value can be converted to an equivalent allowance price in $/tCO2e.

8.4 Infrastructure

Benefits associated with Avoided On-System Capacity Infrastructure are capacity related and are valued at the marginal cost of the on-system infrastructure that the project/program is relieving, measured in dollars per Dth-day. System average marginal costs are used where location specificity of the demand reduction is not known. On-system infrastructure includes the gas transmission system, regulators, and distribution system, which are those parts of the system that are downstream of the city gates. These generally consist of avoided carrying charges (including items such as depreciation and applicable taxes) for capital additions necessary for expanding or upgrading the distribution system to accommodate new business and/or avoided O&M related to maintaining on-system infrastructure.

A natural extension of this is the use of avoided infrastructure costs in the specific case of non-pipe alternative analyses, not for all efficiency programs. In these analyses, the annualized fixed cost of the avoidable capacity under the applicable scenario, measured in $’s/MMBtu-Year, net of its capacity release value, if any. This value is generated as part of the analysis of non-pipes solutions (NPS) programs.

New York Gas Avoided Cost example collected from National Grid Sources as noted.

	WACOPS - Design Day	WACOPS - Design Hour	Peaking Services Gas Commodity Cost	Capacity Costs	Non-Peaking Gas Commodity Cost	Marginal Cost of Service	Gas social cost of carbon
	Nominal Annual Avoided Costs			KEDNY-Gas			
2021	$85	$0	$5.31	$0	$3.81	$178	$55
2022	$87	$0	$5.42	$0	$3.99	$182	$57
2023	$89	$0	$5.52	$0	$4.20	$186	$60
2024	$91	$0	$5.64	$0	$4.41	$189	$62
2025	$92	$0	$5.75	$0	$4.64	$193	$64
2026	$94	$0	$5.86	$0	$4.78	$197	$67
2027	$96	$0	$5.98	$0	$4.94	$201	$69
2028	$98	$0	$6.10	$0	$5.05	$205	$72
2029	$100	$0	$6.22	$0	$5.23	$209	$74
2030	$102	$0	$6.35	$0	$5.34	$213	$77
2031	$104	$0	$6.47	$0	$5.45	$217	$80
2032	$106	$0	$6.60	$0	$5.58	$222	$83
2033	$108	$0	$6.73	$0	$5.69	$226	$87
2034	$111	$0	$6.87	$0	$5.83	$231	$90
2035	$113	$0	$7.01	$0	$5.95	$235	$94
2036	$115	$0	$7.15	$0	$6.22	$240	$97

Notes:

1. WACOPS Design day $/Dth/Day from Exhibit 5-SS of Elizabeth Arangio's December 13, 2019 testimony in Case 19-6-0310, pg. 21

2. Peaking services $/Dth from Exhibit 5-SS of Elizabeth Arangio's December 13, 2019 testimony in Case 19-6-0310, pg. 19

3. Non-peaking gas commodity cost $/Dth from 2018 NYISO CARIS 2 Annual Natural Gas Hub Prices, Unburdened, Zone K

4. Marginal cost of service, $/Dth/Day from 2017 KEDNY Marginal Cost Study, Appendix A pgs. 1-2, sum of transmission and distribution marginal costs per peak Dth, less lost and unaccounted for gas

5. Gas Social cost of carbon from EPA Social Cost of Carbon at 3% discount rate, interpolated and converted from 2007$ to nominal $ based on historical inflation

9. Vermont

Vermont maintains a societal cost test, which is used to assess whether the benefits of energy efficiency will exceed its costs from the perspective of society as a whole. The cost side of the test assesses the incremental cost of the measure or project – the cost differential between a baseline measure and the more efficient measure. The benefit side of the test assesses the avoided costs of a measure, i.e., the incremental costs society avoids by implementing an energy efficiency measure.

9.1 Natural Gas

Vermont includes avoided commodity costs and delivery costs. Price effects are not included. In Vermont, avoided natural gas costs at the retail meter are split into two key components:

1. Avoided cost of gas that is delivered to the citygate station / to the local distribution company

2. Avoided cost to deliver the gas from citygate to the meter on the distribution system

Vermont obtains its natural gas avoided costs from the AESC study, described above in the section describing avoided costs for Massachusetts. Unlike Massachusetts, Vermont does not allow for avoided retail margin costs because Vermont Gas is the sole state-wide gas supplier and is not connected to the New England Gas transmission systems.

In 2020, the State of Vermont Public Utility Commission confirmed avoided natural gas retail costs as broken down in the following categories:[24]

1. $561.39 per MMBtu for design day,

2. $26.27 per MMBtu for peak day,

3. $4.89 per MMBtu for remaining winter days, and

4. $4.48 per MMBtu for shoulder/summer days.

To determine the avoided gas costs at different times in the year, the type of supply that is assumed to be on the margin at that particular time (e.g., design day) is determined. The study analyzed five different end-use categories in the development of marginal cost estimates, each with different assumptions on the timing and magnitude of natural gas use during different periods of the year:[25]

1. Residential heating

2. Residential water heating

3. Residential non-heating

[24] https://drive.google.com/file/d/1saKbiwvZQFNwk2cRnt4sRu0t2YxjEErz/view

[25] https://www.synapse-energy.com/sites/default/files/AESC-2018-17-080-Oct-ReRelease.pdf

4. Commercial and Industrial heating
5. Commercial and Industrial non-heating

The Vermont Public Utility Commission ordered in 2020 that DRIPE not be included in societal cost tests, as it is seen as a transfer payment between economic entities and does not represent a net benefit that warrants inclusion in the societal cost test.[26]

Vermont also includes two other types natural gas avoided costs:

1. Peak day storage costs are also included in the Commission's 2020 order, which is set at $186.2 per MCF and is used in the screening of efficiency measures.
2. Compressed natural gas is included in energy efficiency screening, and is currently set at 75% of the cost of commercial fuel oil.

9.2 Water

Water is included as an avoided cost in energy efficiency measure screening under the societal cost test. In 2019, the avoided cost for net annualized water savings was $4.30/centum cubic feet (CCF).[27]

9.3 Carbon

Vermont includes the avoided cost of carbon emissions as an externality adjustment value used in a non-energy benefit adjustment. The carbon cost is initially assessed as the marginal cost of carbon, based on abatement costs embedded in avoided supply costs included in the Regional Greenhouse Gas Initiative (RGGI). This value is currently estimated to be $100 per ton of CO2.

The externality adjustment value for natural gas, incorporating the aforementioned carbon cost, on a 15-year levelized basis is assessed to by $5.85 per MMBtu, for residential, commercial, and industrial sectors.

9.4 Infrastructure

Vermont does not appear to have avoided costs directly related to avoided infrastructure investments. However, the state does incorporate a 10% discount on all natural gas demand side resources to address the risk of price volatility and infrastructure risk associated with natural gas and conventional natural gas infrastructure.[28] A similar discount is applied to electricity measures, but is set at 5% to account for the reduced risk of electricity system investments, relative to natural gas system investments.

[26] https://drive.google.com/file/d/1saKbiwvZQFNwk2cRnt4sRu0t2YxjEErz/view

[27] https://www.efficiencyvermont.com/Media/Default/docs/plans-reports-highlights/2019/2020%2004%2001_Efficiency%20Vermont%20Savings%20Claim%20Summary%202019.pdf

[28] https://drive.google.com/file/d/1saKbiwvZQFNwk2cRnt4sRu0t2YxjEErz/view. Guidehouse infers that this discount on DSM related to infrastructure risk is associated with the ability of DSM to defer potentially un-needed capacity expansions by acting as a hedge against variability in expected demand; DSM also can avoid additions to supply prices that suppliers occasionally add to protect themselves against price volatility.

10. Wisconsin

The Wisconsin Public Service Commission is statutorily obligated to oversee Wisconsin' statewide energy efficiency and renewable resource program (Focus) Focus on Energy. Avoided costs include natural gas, water, and carbon. There is no specific mandate to include avoided infrastructure costs

10.1 Natural gas

Wisconsin includes avoided commodity costs and delivery costs. Price effects are not included. The Wisconsin natural gas avoided costs methodology is as follows:[29]

- Identify annual forecasted Henry Hub natural gas prices from the most recent EIA Annual Energy Outlook.
- To account for the additional transport and storage costs involved in conveying gas from the Henry Hub to Wisconsin, increase each forecasted Henry Hub price by the five-year average historical differential between Henry Hub prices and Wisconsin City Gate prices, which are also published by the EIA.
- To account for avoidable distribution costs from the City Gate to customers, adjust City Gate prices based on the five-year average historical differential between Wisconsin City Gate prices and Wisconsin retail prices, also published by the EIA.
- Calculate separate differentials for the residential and non-residential sectors in order to recognize the differences in distribution costs between those sectors.
- In addition, reduce the full price differentials to factor out the distribution costs that are fixed in the short term and cannot be avoided through marginal reductions in consumption.

10.2 Water

The Wisconsin natural gas avoided costs methodology is as follows[30]

- $Marginal\ Cost\ of\ Water = (Marginal\ Cost\ of\ Water\ Delivery + Marginal\ Cost\ of\ Wastewater\ Service)$.
- Water delivery rate is estimated using a weighted average from a sample of 25 water utilities in WS
- The final water delivery rate estimates for Wisconsin are $2.50 and $2.89 per 100 cubic feet for residential and commercial sectors, respectively.

[29] *https://apps.psc.wi.gov/ERF/ERFview/viewdoc.aspx?docid=232431*

[30]*https://www.focusonenergy.com/sites/default/files/Annual_Report-CY_2019_Volume_III.pdf*

- The wastewater service rate ($Marginal\ Cost\ of\ Wastewater\ Service$) estimate was constructed from a population-weighted average of marginal (volumetric) wastewater charges for 326 (41%) Wisconsin wastewater service territories.

- The final water wastewater estimate is $3.11 per 100 cubic feet for both residential and commercial.

10.3 Carbon

Wisconsin modifies the standard TRC test design to add as a benefit the value of emissions avoided through the program, including carbon dioxide, sulfur oxides, and nitrogen oxides. This addition reflects statutorily established goals include achieving environmental benefits. The Carbon cost itself is $15/ton.[31]

10.4 Infrastructure

Wisconsin does not appear to include avoided infrastructure costs in cost effectiveness tests.

[31] *https://drive.google.com/file/d/1puFunyWHQqCBaPB0hYMmbMHZKJXxFDKK/view*

guidehouse.com

2022 - 2027 DSM RATE ALLOCATION

1. This Exhibit provides information on the Company's forecast allocation of DSM budget costs for the years 2022 through 2027 and the forecast associated 2022 bill impacts.

DSM Budget Allocation

2. For purposes of allocating DSM budget costs to rate classes, Enbridge Gas split the DSM budget into two components: the DSM budget excluding the low income budget and the DSM low income budget.

3. The DSM budget excluding the low income budget is allocated to rate classes consistent with the 2021 DSM budget allocation, increased to reflect the total change in the DSM budget excluding the low income portion of the budget. This allocation methodology allows for a consistent increase by rate class between 2021 and 2022 of the DSM budget excluding the low income budget.

4. The low income budget is allocated to rate classes in proportion to OEB-approved distribution revenues less DSM budget costs which results in all in-franchise rate classes contributing to the recovery of the low income DSM budget including rate classes which are not eligible to participate in DSM programs.[1] This allocation methodology is consistent with the electricity conservation and demand management framework, as well as the Board's Low-Income Energy Assistance Program ("LEAP").

5. Variances in spend from the proposed allocation included in rates and the actual spend by rate class will be captured in the Demand Side Management Variance Account ("DSMVA"). See Exhibit F, Tab 2, Schedule 1.

[1] EGD Rates 9, 125, 200, & 300 and Union Rates M9, M10, T3, & R25 are not eligible for DSM programs.

6. The DSM budget allocation does not include any amount for the shareholder incentive.

7. Please see Exhibit F, Tab 1, Schedule 2 for the proposed allocation of the DSM budget to rate classes.

Forecast Bill Impacts

8. Enbridge Gas proposes to update the DSM budget in annual rates in accordance with the DSM budget allocation provided at Exhibit F, Tab 1, Schedule 2. Updating annual rates for the DSM budget increase each year allows the increase to be reflected in customer's rates rather than having the annual DSM budget increase reflected in the annual DSMVA balance.

9. Enbridge Gas proposes to continue to pool the Union South Rate M4 and Rate M5 DSM costs and reallocate the pooled costs in proportion to the annual forecast volumes, which results in a common DSM budget unit rate for the two rate classes. This approach began with Union's 2015-2020 DSM Plan and was necessary because of the transition of Rate M5 customers to Rate M4.

10. For the purposes of determining the 2022 bill impact for an average residential customer, Enbridge Gas compared the 2021 DSM budget included in current approved rates to the proposed 2022 DSM budget.

11. For the average Rate 1 residential customer in the EGD rate zone consuming 2,400 m^3 per year, the bill impact is an increase of approximately $1.77 (or an increase of 0.2% of the total bill) in 2022. The average Rate 1 residential customer will pay approximately $20.25 per year or $1.69 per month in DSM costs in 2022. This amount represents approximately 1.9% of the current approved bill.

12. For the average Rate M1 residential customer in the Union South rate zone consuming 2,200 m^3 per year, the bill impact is a decrease of approximately $0.91 (or a decrease of 0.1% of the total bill) in 2022. The average Rate M1 residential customer will pay approximately $18.31 per year or $1.53 per month in DSM costs in 2022. This amount represents approximately 2.1% of the current approved bill.

13. For the average Rate 01 residential customer in the Union North rate zone consuming 2,200 m^3 per year, the bill impact is a decrease of approximately $1.78 (or a decrease of 0.2% of the total bill) in 2022. The average Rate M1 residential customer will pay approximately $12.46 per year or $1.04 per month in DSM costs in 2022. This amount represents approximately 1.1% of the current approved bill.

14. The 2022 bill impacts for Enbridge Gas's other in-franchise rate classes range from -0.3% to 0.4% of the current approved total bill.

15. Please see Exhibit F, Tab 1, Schedule 3 for the 2022 bill impacts for all in-franchise rate classes.

ENBRIDGE GAS INC.
2022 - 2027 DSM Plan
DSM Budget - Proposed Allocation to Rates

Line No.	($000's)	2022 Budget: Budget less Low Income (1)	2022 Budget: Low Income Budget	2022 Budget: Total Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget
	EGD Rate Zone								
1	Rate 1	31,700	11,483	43,182	45,170	47,254	49,438	51,728	54,129
2	Rate 6	18,153	4,618	22,771	23,819	24,918	26,070	27,278	28,544
3	Rate 9	-	-	-	-	-	-	-	-
4	Rate 100	-	-	-	-	-	-	-	-
5	Rate 110	1,704	233	1,938	2,027	2,120	2,218	2,321	2,429
6	Rate 115	1,312	69	1,382	1,445	1,512	1,582	1,655	1,732
7	Rate 125	-	162	162	169	177	185	194	203
8	Rate 135	260	14	273	286	299	313	327	342
9	Rate 145	1,596	-	1,596	1,670	1,747	1,827	1,912	2,001
10	Rate 170	2,247	0	2,247	2,351	2,459	2,573	2,692	2,817
11	Rate 200	-	39	39	41	43	45	47	49
12	Rate 300	-	1	1	1	1	1	1	1
13	**Total EGD**	**56,973**	**16,619**	**73,592**	**76,979**	**80,530**	**84,252**	**88,155**	**92,246**
	Union South								
14	Rate M1	20,217	5,936	26,153	27,357	28,619	29,942	31,329	32,783
15	Rate M2	9,921	808	10,729	11,223	11,740	12,283	12,852	13,448
16	Rate M4 (2)	2,922	210	3,132	3,276	3,427	3,586	3,752	3,926
17	Rate M5 (2)	2,010	146	2,156	2,256	2,360	2,469	2,583	2,703
18	Rate M7	2,036	72	2,108	2,205	2,307	2,414	2,525	2,643
19	Rate M9	-	16	16	17	18	19	20	21
20	Rate M10	-	0	0	0	0	0	0	0
21	Rate T1	1,393	166	1,558	1,630	1,705	1,784	1,867	1,953
22	Rate T2	3,745	825	4,569	4,780	5,000	5,231	5,474	5,728
23	Rate T3	0	103	103	108	113	118	124	130
24	**Total Union South**	**42,243**	**8,283**	**50,526**	**52,852**	**55,290**	**57,845**	**60,525**	**63,334**
	Union North								
25	Rate 01	3,215	2,581	5,796	6,063	6,342	6,635	6,943	7,265
26	Rate 10	2,752	361	3,113	3,257	3,407	3,564	3,730	3,903
27	Rate 20	1,534	234	1,767	1,849	1,934	2,024	2,117	2,215
28	Rate 25	-	73	73	77	80	84	88	92
29	Rate 100	890	243	1,132	1,185	1,239	1,296	1,356	1,419
30	**Total Union North**	**8,391**	**3,492**	**11,882**	**12,429**	**13,003**	**13,604**	**14,234**	**14,894**
31	**Total Company**	**107,606**	**28,394**	**136,000**	**142,260**	**148,822**	**155,701**	**162,914**	**170,475**

Notes:

(1) EGD Rates 9, 125, 200, & 300 and Union Rates M9, M10, T3, & R25 are not eligible for DSM programs. These rate classes will however be subject to rate allocations related to the Low Income Program and Affordable Housing Savings By Design offering as well as the Low Income portion of Portfolio overheads.

(2) Allocation to Union South Rates M4 and M5 prior to rate pooling adjustment.

ENBRIDGE GAS INC.
2022 - 2027 DSM Plan
2022 DSM Budget Bill Impacts

Line No.	Rate Class	2021 DSM Budget in Rates (1) ($000s)	2022 Proposed DSM Budget (2) ($000s)	Change (%)	2021 Billing Units (1) (10^3m^3)	2021 DSM Unit Rate (cents/m^3)	2022 Proposed DSM Unit Rate (3) (cents/m^3)	Representative Annual Billing Units (m^3)	2022 DSM Amounts in Total Bill: Annual ($)	2022 DSM Amounts in Total Bill: Monthly ($)	2022 DSM Budget Change Impact ($ / customer)	April 2021 QRAM Total Bill (4) ($)	2022 DSM Budget: Total Bill (%)	2022 DSM Budget: 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)	(j)=(h/k)
	EGD Rate Zone													
1	Rate 1	39,406	43,182	10%	5,118,240	0.7699	0.8437	2,400	20.25	1.69	1.77	1,069	1.9%	0.2%
2	Rate 6	21,074	22,771	8%	4,923,001	0.4281	0.4625	22,606	105	9	8	8,088	1.3%	0.1%
3	Rate 9	3	-	-100%	-	-	-	-	-	-	-	-	-	-
4	Rate 100	-	-	-	34,607	-	-	339,188	0	0	-	99,893	0.0%	0.0%
5	Rate 110	1,752	1,938	11%	990,703	0.1768	0.1956	598,568	1,171	98	112	165,622	0.7%	0.1%
6	Rate 115	1,319	1,382	5%	486,459	0.2711	0.2840	4,471,609	12,700	1,058	575	1,145,755	1.1%	0.1%
7	Rate 125 (5)	110	162	47%	111,124	0.0991	0.1458	-	40,503	3,375	12,984			
8	Rate 135	255	273	7%	63,812	0.4000	0.4281	598,567	2,562	214	168	150,203	1.7%	0.1%
9	Rate 145	1,597	1,596	0%	28,113	5.6821	5.6781	598,568	33,987	2,832	(24)	173,251	19.6%	0.0%
10	Rate 170	2,195	2,247	2%	276,738	0.7933	0.8121	9,976,120	81,013	6,751	1,877	2,352,250	3.4%	0.1%
11	Rate 200 (5)	38	39	3%	181,849	0.0210	0.0216	-	39,197	3,266	1,038			
12	Rate 300 (5)	7	1	-90%	187	3.9201	0.3927	-	735	61	(6,603)			
13	Total EGD	67,757	73,592											
	Union South Rate Zone													
14	Rate M1	27,446	26,153	-5%	3,142,868	0.8733	0.8321	2,200	18.31	1.53	(0.91)	880	2.1%	-0.1%
15	Rate M2	10,658	10,729	1%	1,340,433	0.7951	0.8004	250,000	2,001	167	13	67,744	3.0%	0.0%
16	Rate M4 (6)	4,743	4,819	2%	707,951	0.6699	0.6807	875,000	5,956	496	94	238,244	2.5%	0.0%
17	Rate M5 (6)	522	469	-10%	68,930	0.7568	0.6807	6,500,000	44,247	3,687	(4,947)	1,585,878	2.8%	-0.3%
18	Rate M7	2,034	2,108	4%	595,232	0.3418	0.3542	36,000,000	127,507	10,626	4,468	8,445,804	1.5%	0.1%
19	Rate M9	-	16	-	103,990	-	0.0158	6,950,000	1,099	92	1,099	1,119,963	0.1%	0.1%
20	Rate M10	-	0	-	391	-	0.0412	94,500	39	3	39	20,105	0.2%	0.2%
21	Rate T1	1,569	1,558	-1%	444,974	0.3526	0.3502	11,565,938	40,502	3,375	(279)	2,721,662	1.5%	0.0%
22	Rate T2	4,725	4,569	-3%	4,571,591	0.1034	0.1000	197,789,850	197,691	16,474	(6,752)	43,934,364	0.4%	0.0%
23	Rate T3	-	103	-	283,374	-	0.0365	272,712,000	99,539	8,295	99,539	42,468,987	0.2%	0.2%
24	Total Union South	51,698	50,526											
	Union North Rate Zone													
25	Rate 01	6,625	5,796	-13%	1,023,451	0.6473	0.5663	2,200	12.46	1.04	(1.78)	1,140	1.1%	-0.2%
26	Rate 10	3,127	3,113	0%	359,134	0.8706	0.8669	250,000	2,167	181	(9)	86,150	2.5%	0.0%
27	Rate 20	1,753	1,767	1%	686,307	0.2554	0.2575	15,000,000	38,630	3,219	313	3,837,257	1.0%	0.0%
28	Rate 25	-	73	-	80,723	-	0.0908	2,275,000	2,065	172	2,065	579,929	0.4%	0.4%
29	Rate 100	1,147	1,132	-1%	1,089,225	0.1053	0.1040	240,000,000	249,512	20,793	(3,282)	65,692,840	0.4%	0.0%
30	Total Union North	12,652	11,882											
31	Total Company	132,107	136,000											

Notes:
(1) EB-2020-0095, 2021 Rates Decision and Order dated Nov. 6, 2020, Appendix A, p. 139 and Appendix B, pp. 243 - 246.
(2) Exhibit F, Tab 1, Schedule 2.
(3) 2022 proposed DSM unit rates calculated based on 2021 billing units.
(4) Total sales service bill based on EB-2021-0070 (April 2021 QRAM) excluding cost/price adjustments. Total bill for Rate M9, Rate M10 and Rate T3 excludes the federal carbon charge.
(5) Annual bill impact amounts for EGD Rate 125, Rate 200, and Rate 300 are for average customers in each rate class.
(6) Rate M4 and Rate M5 DSM costs are pooled and reallocated in proportion to forecast volumes.

DSM ACCOUNTING CONSIDERATIONS

1. As part of this Application Enbridge Gas proposes to establish new deferral and variance accounts to reflect the amalgamation of each legacy utilities DSM programs into a combined DSM plan.

2. Starting with the 2022 DSM Plan, DSM Programs have been amalgamated to serve all EGI customers which include both the EGD and Union rate zones. For this reason, Enbridge Gas is proposing the establishment of the following EGI accounts to be used for the 2022–2027 DSM Plan.

Demand Side Management Variance Account ("DSMVA") - EGI

3. The purpose of this account is to record the difference between the actual DSM spending for the fiscal year and the budgeted amount included within rates. Amounts determined to be over or under the budget included within Allowed Revenue will be recorded in the DSMVA. In addition, any further variance in DSM spending and results, beyond the budget included within rates, which occur as a result of OEB decisions in ongoing or upcoming DSM proceedings, will be included within the DSMVA.

4. The DSMVA will also be used to track forecast commitments for customer incentive payments and program costs for future periods. Due to the multi-year aspect of several program offerings, incentive and program dollars committed in the current year may not be payable until they become due in future years. The DSMVA will be used to track and carry forward the forecasted cumulative customer incentive and program dollar commitments net of payments made (in relation to incentive or program payments made in the current year, or in relation to incentives or program dollars paid that became due in the current year in relation to commitments made in prior years). Any amount not paid out will be returned to ratepayers in the year

following its last potential commitment date, or at such other time as directed by the OEB.

5. Any balance in this account would be subject to simple interest calculated on the opening monthly balance of this account using the OEB approved EB-2006-0117 interest rate methodology. The balance of this account, together with carrying charges, would be disposed of in a manner to be designated by the OEB in a future rate hearing.

Lost Revenue Adjustment Mechanism ("LRAM") - EGI

6. The Purpose of this account is to record the amount of distribution margin gained or lost when the Company's DSM programs are less or more successful than budgeted in the fiscal year.

7. Any balance in this account would be subject to simple interest calculated on the opening monthly balance of this account using the OEB approved EB-2006-0117 interest rate methodology. The balance of this account, together with carrying charges, would be disposed of in a manner to be designated by the OEB in a future rate hearing.

Demand Side Management Incentive Deferral Account ("DSMIDA") – EGI

8. The purpose of the DSMIDA is to record the actual amount of the shareholder incentive earned by the Company as a result of its DSM programs. The criteria and formula used to determine the amount of any shareholder incentive, to be recorded in the DSMIDA, will be in accordance with the Proposed DSM Framework in this Application.

Conservation Demand Management Deferral Account ("CDMDA") – EGI

9. The purpose of the CDMDA is to track and account for the ratepayer share of all net revenues generated by DSM services provided for electric CDM activities. The ratepayer share is 50% of net revenues, using fully allocated costs.

10. Any balance in this account would be subject to simple interest calculated on the opening monthly balance of this account using the OEB approved EB-2006-0117 interest rate methodology. The balance of this account, together with carrying charges, would be disposed of in a manner to be designated by the OEB in a future rate hearing.

11. Enbridge Gas will also continue to use the DSM deferral and variance accounts for the legacy rate zones as established and approved in prior Accounting Orders for DSM activities up to and including 2021. Enbridge Gas proposes to maintain these accounts until all balances relating to DSM Plans up to and including 2021 have been cleared, after which the accounts will be discontinued. The accounts being maintained are as follows:
    - Demand Side Management Variance Account ("DSMVA") - EGD Rate Zone
    - Lost Revenue Adjustment Mechanism ("LRAM") - EGD Rate Zone
    - Demand Side Management Incentive Deferral Account ("DSMIDA") – EGD Rate Zone
    - Electric Program Earnings Sharing Deferral Account ("EPESDA") – EGD Rate Zone
    - Demand Side Management Cost-Efficiency Incentive Deferral Account ("DSMCEIDA") – EGD Rate Zone
    - Demand Side Management Variance Account ("DSMVA") – Union Rate Zones
    - Lost Revenue Adjustment Mechanism ("LRAM") - Union Rate Zones
    - Demand Side Management Incentive Deferral Account ("DSMIDA") – Union Rate Zones

- Conservation Demand Management Deferral Account – Union Rate Zone
- Demand Side Management Incentive Deferral Account – Union Rate Zone