FINAL REPORT

Net-to-Gross Evaluation for Ontario's Natural Gas Custom C&I DSM Programs

Ontario Energy Board

Date: November 8, 2024

Table of contents

List of figures

List of tables

EXECUTIVE SUMMARY

To verify the impacts of the Enbridge Gas Distribution, Inc. (Enbridge) demand side management (DSM) programs, the Ontario Energy Board (OEB) undertakes various annual evaluation studies. The Net-to-Gross Evaluation of the 2023 Natural Gas Demand Side Management is summarized in this document.

In 2023, Enbridge delivered ratepayer-funded DSM programs to customers, including custom programs delivered to large volume, commercial, and industrial customers that encouraged them to reduce their energy consumption by providing customer-specific energy efficiency and conservation solutions. The custom programs offered provide financial incentives, technical expertise, and guidance with respect to energy-related decision-making and business justification to help customers prioritize energy efficiency projects against their own internal competing factors. Multifamily buildings – other than low-income buildings, which are dealt with separately – are eligible to participate in Enbridge's custom commercial programs.

The OEB evaluates the custom commercial and industrial program results annually as the programs have significant OEB-approved savings targets. Based on the results of the utilities' programs, the utilities may be eligible for performance incentives. The portion of shareholder incentives that come from the custom commercial and industrial programs is based on the amount of verified net natural gas savings achieved by each utility relative to the OEB-approved targets.

- **Verified savings** are utility draft program savings that are audited and confirmed by an independent third party. The process and results of the verification are described in a separate report. The result of the analysis is a ratio that represents the percentage of utility-draft energy savings that are verified by the auditor.
- **Net savings** are those that are caused, or influenced, by the utility, including attributable (non-free rider) program savings and spillover. The process and results of the net savings assessment are described in two separate reports: this report, the 2023 Natural Gas Demand Side Management Net-to-Gross Evaluation report (published 2024), and the CPSV Participant Spillover Results report (published 2018). The result of the analysis is a ratio that represents the percentage of verified savings that were caused by the utility.

The two ratios are applied to the utility draft savings to produce final verified net natural gas savings according to the equation in the following figure.

This report provides the free-ridership-based attribution ratio which once combined with spillover becomes the net savings ratio. For the agriculture segment this report also includes results from the 2024 spillover study focused on that segment. The net savings ratio together with claimed savings and the verification ratio serves as an input used to calculate verified net savings. The customer program results are combined with the results from other utility programs in a "scorecard." The utilities' scorecard results determine overall performance and if the utility is eligible for a shareholder incentive.

The following table provides an example of how the results from this report could be used to calculate the net savings ratio for each segment. Apart from the agricultural segment, the free-ridership-based attribution ratios are combined with spillover

ratios from the 2013-2014 spillover study[1], the most recent spillover results for the non-agricultural segments. For segments that consist of multiple 2013-2014 spillover domains, a 2023 savings weighted average of the 2013-2014 spillover ratios is used in the example table. The table is shown for illustration of how the free-ridership-based attribution ratios can be combined with the spillover ratios to calculate the net savings ratios. For each year, the year specific application of results is decided within the scope of the annual verification reporting process.

Net savings ratio example

Program	Segment	Free-ridership-based attribution	Spillover ratio	Net savings ratio	Population m^3 savings	Percent population m^3 savings
Commercial	Commercial	65.81%	1.03%	66.84%	6,100,147	4%
	Institutional	73.55%	0.50%	74.05%	11,065,539	6%
	Market Rate Multi-Residential	65.74%	6.64%	72.38%	10,074,677	6%
Industrial	Agricultural	62.52%	14.96%	77.48%	30,754,095	18%
	Industrial	64.19%	1.22%	65.41%	32,772,861	19%
Large Volume	Large Volume	27.95%	0.82%	28.77%	80,549,726	47%

The following tables show the free-ridership-based attribution and the spillover for the agriculture segment.

Custom program	Free-ridership-based attribution
Commercial	68.54%
Industrial	63.47%
Large Volume	27.95%

Commercial program

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± at 90% confidence (FPC on)	Population m^3 savings	Percent population m^3 savings
Commercial	65.81%	32	38	12%	6,100,147	22%
Institutional	73.55%	19	24	14%	11,065,539	41%
Market Rate Multi-Residential	65.74%	32	35	9%	10,074,677	37%
Commercial Program Overall	68.54%	83	97	7%	27,240,363	100%

Industrial program

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± at 90% confidence (FPC on)	Population m^3 savings	Percent population m^3 savings
Agricultural	62.52%	31	49	8%	30,754,095	48%
Industrial	64.19%	46	58	7%	32,772,861	52%
Industrial program overall	63.47%	77	107	6%	63,526,956	100%

[1] CPSV Participant Spillover Results, DNV for the Ontario Energy Board, May 23, 2018

Agriculture Segment Spillover

M^3 Results	Spillover ratio	Sample customers	Sample sites	± at 90% confidence (FPC on)	Population m^3 spillover savings
Spillover relative to program savings - all sources	14.96%	105	143	11.91%	4,599,439
Spillover relative to consumption - all sources	0.54%	105	143	0.43%	4,599,439

Large volume

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± at 90% confidence (FPC on)	Population m^3 savings	Percent population ^{m3} savings
Large Volume Program Overall	27.95%	14	20	4%	80,549,726	100%

Findings and recommendations

The following table presents a summary of the key findings and recommendations from the study. It shows the party to whom the recommendation applies and its primary beneficial outcome. We classified outcomes into four categories: reduce costs, increase savings, increase (or maintain) customer satisfaction, and decrease risk (multiple types of risk are in this category including risk of adjusted savings, risk to budgets or project schedules, and others). All recommendations address energy savings and program performance.

Energy savings and program performance		Applies to		Primary beneficial outcome			
Finding	Recommendation	Enbridge	Evaluation	Reduce costs	Increase savings	Customer satisfaction	Decrease risk
FR-based attribution in the programs is variable	Evaluate free-ridership for the programs annually and couple the free-ridership evaluation with process evaluation		✓		✓		
FR-based attribution for the programs came primarily through acceleration	Consider strategies to have greater impact on increasing efficiency and amount (where applicable) of measures	✓			✓		
Many customers with high FR report involving Enbridge late in the process	Consider strategies to reduce customers taking advantage of the rebate for projects that are already fully decided upon.	✓			✓		✓
Return on Investment is mentioned consistently by customers and vendors as a key metric	Continue emphasis on ROI effect of incentives with customers. Consider helping to quantify kWh, water and other non-energy benefits of projects to sell projects that do not pass ROI on gas savings alone	✓			✓		

Energy savings and program performance		Applies to		Primary beneficial outcome			
Finding	Recommendation	Enbridge	Evaluation	Reduce costs	Increase savings	Customer satisfaction	Decrease risk
Safety code requirements differ among commercial buildings can affect energy saving measures	Consider reviewing safety code requirements for facilities likely to have higher than typical code.	✓					✓
Reducing Carbon tax bills is a driver for some customers	Consider ways to leverage Carbon tax and Carbon effects as part of the package to motivate customers to participate	✓			✓		
The Large Volume program has high free ridership	Consider the high free-ridership within the context of the cost effectiveness of the program. High free rider programs can still deliver meaningful cost-effective net savings.		✓		✓	✓	
	Conduct a process evaluation to improve Large Volume influence on customer projects	✓			✓	✓	✓
	Consider limiting the measure types or payback periods that are eligible for Large Volume incentives	✓			✓	✓	✓
Vendor attribution increased program attribution significantly for the Enbridge Commercial and Multifamily Segments	Consider expanding approaches to market for other programs that leverage third-party vendors.	✓		✓	✓		
Vendor attribution recruitment resulted in less completed interviews than desired.	Consider interviewing participating vendors independent of the participating customer sample and recruitment.		✓		✓		✓
In the attribution scoring methodology, timing assumptions, specifically the number of years assumed for "never would have implemented" have a significant effect on FR-based attribution.	Consider studying the typical planning horizons for each of the customer segments. The assumed planning horizon for companies is used in the scoring to determine at what point the program receives full influence credit for accelerating a measure's implementation.		✓				✓
The treatment of efficiency in the scoring has a relatively small effect FR-based attribution.	Consider simplifying the efficiency question sequence in future research to reduce survey length while still capturing attribution.		✓			✓	
A significant amount of spillover was found in the Agricultural segment.	Consider replicating the agriculture go-to-market approach in segments where it may provide similar results. In other customer groups this might be a combination of customer segmentation and specific measure type focus to achieve similar market effect in different niches.	✓			✓		

Energy savings and program performance		Applies to		Primary beneficial outcome			
Finding	Recommendation	Enbridge	Evaluation	Reduce costs	Increase savings	Customer satisfaction	Decrease risk
Data collection for the Agricultural segment spillover study was successful, with some areas for improvement.	Consider replicating the spillover study approach in segments where it may be applicable. Applicable segments include those with a strong program theory for market effects in a specific segment or segment-measure combination and those with known high market share for the program in an area.		✓		✓		
	The offered incentive and multi-modal survey approach led to higher than typical response rate for a general population study and should be considered for future research that includes non-participants.		✓	✓			✓
	Attempting to collect sufficient detail for site specific energy savings calculations provided marginal value and should be reconsidered.		✓	✓			
	Adding a question about why customers did not go through the program could provide additional value in future studies of this type.		✓				✓
The spillover study found 14.96% annual m3 spillover and 11.21% lifetime CCM spillover.	The spillover found in the study should be applied to the agricultural custom offering results using the percent of program savings ratios.	✓	✓		✓		
	The separate annual and lifetime ratios should be applied to calculate the annual and cumulative savings respectively.	✓	✓		✓		
	The spillover found in this study should replace the value found in the 2015 participant survey as this study covers both participant and non-participant spillover.	✓	✓		✓		

1 INTRODUCTION

On behalf of the Ontario Energy Board (OEB), DNV carried out the Net-to-Gross Study alongside the Custom Program Savings Verification (CPSV) of Enbridge Gas Inc.'s (Enbridge) natural gas demand-side management (DSM) programs delivered in 2023. The study produced free-ridership (FR) and spillover (SO) ratios for the set of Enbridge custom programs examined, shown in Table 1-1.

Table 1-1. FR by program, 2023

Program	2023 FR	2023 SO
Large Volume	✓	
Commercial*	✓	
Industrial**	✓	✓
Affordable Housing Multi-Residential		

*Custom Market-Rate Multi-Residential (Multifamily) projects are expected to be included as a part of this program.
**Non-participant spillover in the agricultural segment was studied.

1.1 Evaluation objectives and approach

The overall objectives of this study were to:

- Develop appropriate free-ridership rates for Enbridge custom projects (excluding low-income) carried out in 2023, with disaggregated rates within these groups.
- Establish and maintain transparency throughout the project
- Follow industry best practices

The methodology selected for the FR evaluation relied on end-user self-report surveys and interviews. The end-user self-reports were supplemented by project-specific interviews with vendors to capture the indirect effects of the programs on end-user decision-making. Surveys and interviews were collected from the most recent (2023) program years in order to create FR factors (later to be combined with spillover (SO) factors to create NTG factors ahead of 2023 verification activities) that will be most meaningful for future years.

1.2 Study background

To encourage Enbridge Gas Distribution, Inc. (Enbridge) to implement public benefits programs designed to reduce overall energy use, called conservation demand-side management (DSM) programs, the Ontario Energy Board (OEB) reimburses them for the cost of program implementation and provides an incentive, called the shareholder incentive, that reflects the utilities' performance against pre-determined targets. The OEB also compensates the utilities for the revenue lost as a result of the lower natural gas sales.

In the 2023 calendar year, programs delivered by Enbridge targeted all natural gas ratepayers, including residential, multifamily, low income, commercial, and industrial customers. This study is part of an overall conservation program cycle as shown in the following figure. This study is part of step 4.

Figure 1-1. Conservation program cycle

To verify the impacts of the Enbridge DSM programs, the OEB sponsors studies to verify the energy savings achieved. Specifically, this study researched attribution rates, which are estimates of the influence the utility had on the energy efficiency projects that were installed and measured as a percentage of the savings "attributable" to the utility. As part of the annual verification report, the results of this study are combined with the results of three other studies[2,3] to produce verified net cumulative gas savings for the utilities' 2023 Custom programs. This study was completed by DNV concurrent with the 2023 Custom Savings Verification Study, though independent samples were selected and separate analyses performed for each.

The remainder of this report references the following industry terms. Additional definitions are found in the glossary in APPENDIX A.

- **Free rider:** a customer who would install the same energy efficiency measure without intervention from the utility.
- **Free-ridership:** the portion of a program's verified energy savings that would naturally occur without intervention from the utility.
- **Spillover:** energy savings that occur as a result of the utility's intervention, but are not part of the utility's verified savings. For example, if the utility identifies (and the customer implements) an energy efficiency measure that does not require payment to a vendor for equipment or servicing, the customer would not receive an incentive and the utility would not claim those energy savings. The energy savings are considered spillover.
- **Attribution:** the portion of a program's verified energy savings that the utility influenced, including the effects of free-ridership and spillover. When multiplied by the utility's claimed savings, the attribution ratio produces the volume of energy saved as a result of program implementation.
- **Free-ridership-based attribution:** The portion of a program's verified energy savings that the utility influenced if one only considers free-ridership and not spillover. Free-ridership-based attribution is the complement of free-ridership (free-ridership-based attribution = 100% – free-ridership).

[2] *CPSV Participant Spillover Results.* Prepared for The Ontario Energy Board by DNV, May 23, 2018.
[3] *2023 Natural Gas Demand Side Management Custom Savings Verification.* Prepared for The Ontario Energy Board by DNV, November 25, 2024.

2 COMMERCIAL CUSTOM PROGRAM

Enbridge's custom DSM program for commercial customers encourages customers to reduce their natural gas consumption by recommending and incentivizing energy saving projects and actions.

This custom program differs from the prescriptive programs by providing additional technical support for projects and financial incentives based on overall natural gas savings realized by the customer rather than a per-unit incentive.[4]

A subset of the projects in this program is part of the multi-residential segment. The free-ridership (FR)-based attribution study included custom projects from the Market-Rate Multifamily (MR MF) section of the program. Under the 2023 DSM framework,[5] low-income projects use a deemed (pre-determined) value for Low Income Multifamily (LI MF) free-ridership, so the LI MF segment was not included in the free-ridership-based attribution evaluation.

All non-LI MF projects implemented as part of these programs and claimed in 2023 as custom projects are included in the scope of the FR study.

2.1 Free-ridership-based attribution rate

The FR-based attribution ratio represents the ratio of the savings influenced by the utility (considering only free-ridership, not spillover) to the savings verified by the evaluation, as shown in the following equation. The methods used to determine evaluation verified savings are presented in a separate report.[6] A 90% FR-based attribution ratio means the utility-influenced savings (considering only free-ridership) were 90% of the program savings.

$$free-ridership-based\ attribution = \frac{Utility\ influenced\ savings\ considering\ only\ free-ridership, not\ spillover}{Program\ savings}$$

Table 2-1 shows the FR-based attribution ratio by domain for the Enbridge Commercial Custom program. The table shows the FR-based attribution ratio, statistical precision at the 90% confidence interval, the program-claimed population first year meters cubed (m^3) savings, and percent of program savings for each customer segment. The percent of program savings represents the relative contribution that each customer segment makes to the overall result.

The ratio result is based on an overall sample size of 83 customers and 97 measures. Additional details on stratification, sample size, and population size are provided in APPENDIX D. Additional statistical details for the results are provided in APPENDIX G.

The Commercial free-ridership-based attribution rate includes the effect of indirect utility influence on non-institutional projects through vendors. Vendor attribution was studied for non-institutional commercial projects due to the design of the program for these segments, which included significant vendor outreach and efforts to influence vendor business practices to increase sales of gas saving measures. APPENDIX H provides more detail on the vendor attribution. Influence on projects through vendors increased the Commercial measure type free-ridership-based attribution rates by 15 percentage points (from 51% to 66%), and increased Market Rate Multifamily attribution by free-ridership attribution by 31% (from 35% to 66%). Results from vendors did not show an influence on the Institutional segment.

[4] Enbridge's Annual Report provides a more detailed description of the program and can be found here: https://www.oeb.ca/sites/default/files/OEB-Annual-Report-2022-2023-EN.pdf

[5] EB-2021-0002

[6] *2023 Natural Gas Demand Side Management Custom Savings Verification.* Prepared for The Ontario Energy Board by DNV, November 25, 2024.

Table 2-1. Free-ridership-based attribution ratio for Commercial custom program*

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± at 90% confidence (FPC on)	Population m^3 savings	Percent population m^3 savings
Commercial	65.81%	32	38	12%	6,100,147	22%
Institutional	73.55%	19	24	14%	11,065,539	41%
Market Rate Multifamily	65.74%	32	35	9%	10,074,677	37%
Commercial Program Overall	68.54%	83	97	7%	27,240,363	100%

* The table shows statistical precision (± at 90% confidence factor) that does include the effects of a finite population correction factor. See Appendix B for more information.

2.2 Components of free-ridership-based attribution

The FR-based attribution rate for each measure is calculated based on participant survey responses to questions regarding the utility's influence on the timing, quantity, and efficiency of the measure installed. This section reports the program's effect on each component and provides an indication of which aspects of the projects show the greatest utility influence.

- **Timing** questions help us understand the impact programs had on when project installations took place by asking participants if they would have implemented measures earlier, later, or at the same time without program assistance
- **Efficiency** questions are geared towards understanding if the equipment had been installed without program incentives and influence, if it would have been more or less efficient as what ended up getting installed.
- **Quantity** questions delve into the program's influence on how many measures were installed as part of the project (if applicable based on measure type) compared to how many would have been installed without the program's influence

Throughout this section, a "Null" value in the table reflects less than five customer responses. For confidentiality reasons, results for less than five responses are not displayed. Customers with more than one installed measure and different survey responses by measure will appear multiple times in the table, resulting in a customer total greater than the number of customers interviewed.

Note that while the ratios in Table 2-1 include vendor influence for the commercial and multifamily segments, tables in this section only provide insight into participant responses and do not incorporate vendor influence.

Table 2-2 represents the possible combinations of timing, efficiency, and quantity attribution. A "yes" in the timing, efficiency, or quantity column indicates partial or full FR-based attribution for that source. A "no" indicates no FR-based attribution for that source. For example, the row that has "yes" for timing, efficiency, and quantity reports the portion of the sample that indicated that the program had at least partial influence on the timing, efficiency, and quantity for that measure. For some measures, efficiency or quantity may not be applicable questions; for the purposes of this table, the not applicable measures are included as "no" on the non-applicable dimension.

The table shows the number of customers, measures, and savings that fall into each timing, efficiency, and quantity combination. The percentage of sample sample-weighted cumulative savings shows the portion of population savings represented by that category.

The table shows that a majority (60%) of program savings were at least partially influenced by the utility (excluding those customers influence through a vendor). Timing is the most common reflection of program influence, with respondents reporting that approximately 50% of the program savings were accelerated by the program. Efficiency affects approximately 25% of the program savings, and the program influenced quantity for approximately 17% of program savings.

Table 2-2. Overview of the sources of attribution for Commercial custom program, excluding vendor-based attribution*

Timing	Efficiency	Quantity	Sample Custs	Sample Meas	Percent of Weighted M3
Yes	Yes	Yes	5	5	4%
		No	12	15	15%
	No	Yes	8	8	5%
		No	19	19	26%
No	Yes	Yes	Null	Null	4%
		No	Null	Null	2%
	No	Yes	Null	Null	4%
		No	35	40	39%

Partial or Full Attribution No Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.

2.2.1 Timing component

Respondents answered a sequence of questions that addresses the timing of the equipment installation. (See APPENDIX K for the full survey instrument.) First, respondents answered the likelihood of installing the same type of equipment at the same time without the program (DAT1a). Respondents who answered "Later" specified the number of months later in the next question (DAT1b).[7] During the acceleration period, the energy savings for early replacement installations includes additional savings credit which reflects the utility-influenced replacement of older, less efficient equipment.

More than 43 customers, accounting for 49% of program savings, said they would have installed their measure(s) at the same time. Projects representing approximately 38% of savings received full attribution by answering that they either never would have installed the measure (10% of savings), would have delayed the project by 48 months or more (6% of savings), or would have delayed the project by between 24 months and 48 months (22%). The remaining 12% of savings received partial timing attribution (Table 2-3).

[7] See the Scope of Work attached in APPENDIX H for the detailed scoring algorithm.

Table 2-3. Determining the acceleration period, Commercial custom program, excluding vendor-based attribution *†

DAT1a. Without the utility when would you have performed the measure?
DAT1b. Approximately how much later?

DAT1a	DAT1b	Timing Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same Time	N/A	0%	43	49	49%
Earlier	N/A	0%	Null	Null	1%
Later	Months <24	ER baseline credit for months accelerated	8	8	4%
	24≤ Months <48	100% ER baseline credit	12	14	22%
	Months ≥48	100% ER baseline credit	Null	Null	6%
	Don't Know/Refused	ER baseline credit for avg. of DAT1b	7	7	6%
Never	N/A	100%	9	11	10%
Don't Know/ Refused	N/A	ER baseline credit for avg. of DAT1a	Null	Null	2%

No Timing Attribution Full or Partial Timing Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
†ER is an acronym for early replacement. N/A represents not applicable.

2.2.2 Efficiency component

Respondents answered a sequence of questions that address the utility's influence on the efficiency level of the installed equipment. (See APPENDIX K for the full survey instrument.) First, respondents were asked whether they would have installed the same level of efficiency without the utility (DAT2a). Respondents who answered that they would have installed a less efficient option answered two follow-up questions: first, "What would you have installed?" (DAT2c), followed by the scored follow-up question (DAT2b) to put their answer into a predetermined category. DAT2c was used to confirm the responses to DAT2b.

The utility had limited influence on efficiency (Table 2-4). Most of the survey respondents (62% of savings) said the utility had no influence on the efficiency level of the equipment installed. Respondents who indicated the utility improved the efficiency level of their measures accounted for approximately 22% of program savings. The remaining respondents, accounting for 16% of program savings, either did not know or did not respond to efficiency attribution.

Table 2-4. Determining efficiency attribution, Commercial custom program, excluding vendor-based attribution *†

DAT2a. Without the utility, would you have installed the same efficiency, lesser or greater?
DAT2b. What efficiency would you have installed?

DAT2a	DAT2b	Efficiency Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same	N/A	0%	56	61	62%
Lower	Baseline Efficiency	100%	8	9	8%
	Between Baseline and Installed Efficiency	50%	9	10	14%
	Don't Know/Refused	Average of Dat2b	Null	Null	2%
	Null	Null	Null	Null	1%
Don't Know/Refused	N/A	Average of dat2a	Null	Null	1%
Not Applicable	N/A	Not Asked	10	10	12%

No Efficiency Attribution Full or Partial Efficiency Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
† N/A represents not applicable.

2.2.3 Quantity component

Respondents answered a sequence of questions that addressed the utility's effects on the quantity or size of the equipment installed. (See APPENDIX K for the full survey instrument.) First, respondents were asked whether they would have installed the same amount of equipment (or capacity for measures for which quantity is less relevant, such as boilers) without the utility (DAT3a). Respondents who answered that they would have installed less (or in some cases more/larger) equipment answered a follow-up question (DAT3b) to specify how the utility changed the amount/size that they installed.

The program had limited influence on the quantity of measures installed. Fifty customers, accounting for 48% of program savings, said they would have purchased the same quantity of equipment without the program (Table 2-5). Customers representing 15% of program savings received partial attribution. Another 35% of savings were from measures for which quantity is not applicable. Examples of not applicable measures include building automation systems, a roof or a system optimization.

Table 2-5. Determining quantity/size attribution, Commercial custom program, excluding vendor-based attribution *†

DAT3a. Without the utility would you have installed the same amount, more or less?
DAT3b. What amount would you have installed?

DAT3a	DAT3b	Quantity Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same	N/A	0%	50	56	48%
Less/Fewer/Smaller	Don't Know/Refused	Average of dat3b	Null	Null	3%
	Partial change	0%<Value<100%	5	5	7%
None	N/A	100%	7	7	6%
Don't Know/Refused	N/A	Average of Dat3a	Null	Null	1%
Not Applicable	N/A	Not Asked	21	23	35%

No Quantity Attribution Full or Partial Quantity Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
† N/A represents not applicable.

2.3 Vendor attribution

Evaluation interviews with the Enbridge program teams indicated that the program design for the Commercial and Multi-Residential segments focuses on working with and influencing vendors who in turn influence customers in their DSM project decisions. Since the other programs and segments are focused on selling DSM directly to customers, not through influencing vendors, it was decided in consultation with the EAC to focus vendor survey resources on designing an approach specific to these Enbridge segments.

The FR participant interviews included a series of framing questions that served to help respondents think through the decision-making process for their projects. Through the responses to these questions, the interview was able to identify projects where a vendor played a role in the decision making. This data was collected for each program and was used to trigger vendor interviews.

Across all programs and segments, vendors play a role in the decision making for most projects. This indicates that there could be opportunity for programs to increase net savings through proactively working with vendors as is the case with these segments' program strategy.

Table 2-6 shows that nearly all participants in the Institutional segment indicated that a vendor was involved in their decision making on the project.

Table 2-6. Vendor interviews for Custom Commercial – Institutional program

Vendor Involvement	Participant Attribution	Sample Customers	Sample Measures
Not Involved in Decision	100% Participant Attribution	3	3
Involved in Decision	100% Participant Attribution	8	10
	Less than 100% Participant Attribution	9	11

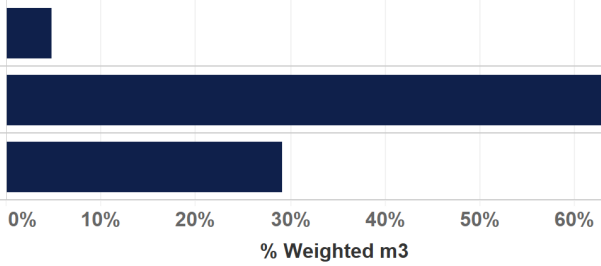


Table 2-7 and Table 2-8 show that nearly all measures in the Commercial and Multi-Residential segments had vendor involvement in project decision making.

Table 2-7. Vendor interviews for Custom Commercial – Commercial program

Vendor Involvement	Participant Attribution	Vendor Interview	Vendor Complete	Sample Customers	Sample Measures
Not Involved in Decision	Less than 100% Participant Attribution	Did not attempt vendor interview	N/A	1	1
Involved in Decision	100% Participant Attribution	Did not attempt vendor interview	N/A	8	10
	Less than 100% Participant Attribution	Attempted vendor interview	N/A	12	14
			Completed Vendor Interview	11	13

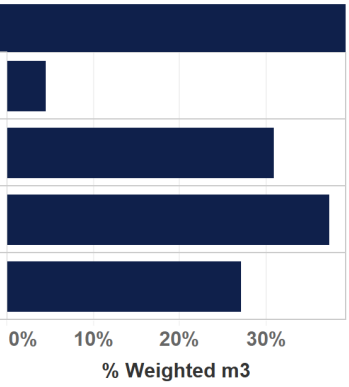


Table 2-8. Vendor interviews for Custom Commercial – Market Rate Multi-Residential program

Vendor Involvement	Participant Attribution	Vendor Interview	Vendor Complete	Sample Customers	Sample Measures
Not Involved in Decision	Less than 100% Participant Attribution	Did not attempt vendor interview	N/A	4	4
Involved in Decision	100% Participant Attribution	Did not attempt vendor interview	N/A	5	6
	Less than 100% Participant Attribution	Attempted vendor interview	N/A	12	12
			Completed Vendor Interview	11	13

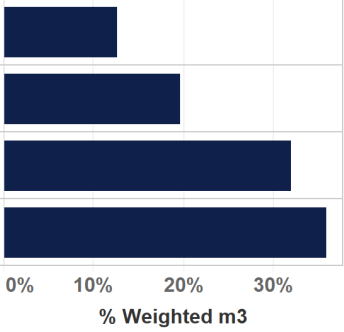


Table 2-9 shows that vendor attribution increased attribution by 18% for the Commercial segment and by 31% for the Multi-Residential segment. The results for these segments indicate that Enbridge is affecting vendor recommendations and that customers, particularly in the multifamily segment, rely on vendor involvement in making equipment and maintenance decisions.

Table 2-9. Free-ridership-based attribution with and without vendors for Commercial and Multi-Residential segments

Segment	Approach	Free-ridership based-attribution	Lower bound at 90% confidence	Upper bound at 90% confidence
Commercial	Vendor Included	66%	49%	72%
	Without Vendor	51%	39%	62%
Market Rate Multi-Residential	Vendor Included	66%	57%	74%
	Without Vendor	35%	19%	50%

Table 2-10 and Table 2-11 shows the dimensions of attribution where Enbridge's effect on vendors had the most impact. Efficiency was the most common dimension affected, which is the expected result: vendors cannot affect timing for replace on burnout measures and quantity/size is often pre-determined by site needs as well. Many measures received no increase (18 commercial and 15 multi residential) as the vendor effect was lower than the direct Enbridge attribution on the dimensions where Enbridge affected their vendor.

Table 2-10. Overview of the sources of vendor attribution – Commercial program

Sample Customers	Sample Measures	Vendor Increase to Timing	Vendor Increase to Efficiency	Vendor Increase to Quantity	Vendor increase to Simple Program Attribution (SPA)
1	1	Yes	No	No	Yes
		No	No	No	Yes
3	4	No	No	Yes	No
4	4	No	Yes	No	No
9	10	No	Yes	Yes	No
14	18	No	No	No	No

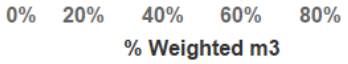
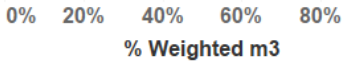


Table 2-11. Overview of the sources of vendor attribution – Market Rate Multi-Residential program

Sample Customers	Sample Measures	Vendor Increase to Timing	Vendor Increase to Efficiency	Vendor Increase to Quantity	Vendor increase to Simple Program Attribution (SPA)
1	1	Yes	Yes	No	No
			No	No	Yes
2	3	No	No	No	Yes
14	15	No	No	No	No
15	15	No	Yes	No	No



3 INDUSTRIAL CUSTOM PROGRAM

Enbridge's custom DSM program for industrial customers encourages customers to reduce their natural gas consumption by recommending and incentivizing energy saving projects and actions.

This custom program differs from the prescriptive programs by providing additional technical support for projects and financial incentives based on overall natural gas savings realized by the customer rather than a per-unit incentive.[8]

3.1 Free-ridership-based attribution rate

The FR-based attribution ratio represents the ratio of the savings influenced by the utility (considering only free-ridership, not spillover) to the savings verified by the evaluation, as shown in the following equation. The methods used to determine evaluation-verified savings are presented in a separate report.[9] A 90% FR-based attribution ratio means the utility-influenced savings (considering only free-ridership) were 90% of the evaluation verified savings.

$$free-ridership-based\ attribution = \frac{Utility-influenced\ savings\ considering\ only\ free-ridership, not\ spillover}{Evaluation-verified\ savings}$$

Table 3-1 shows the FR-based attribution ratio by domain for the Enbridge Custom Industrial programs. The table shows the FR-based attribution ratio, statistical precision at the 90% confidence interval, the program-claimed population first year m^3 savings, and percent of program savings for each customer segment. The percent of program savings represents the relative contribution that each customer segment makes to the overall result.

The ratio result is based on an overall sample size of 77 customers and 107 measures. Additional details on stratification, sample size, and population size are provided in APPENDIX D. Additional statistical details for the results are provided in APPENDIX G. The Enbridge free-ridership-based attribution rate is 63% for the Industrial Agricultural segment and 64% for the Industrial segment.

Vendor attribution was studied for Agricultural projects due to the design of the program for this segment, which included significant vendor outreach and efforts to influence vendor business practices to increase sales of gas saving measures. Vendor attribution was not studied for the industrial segment as the program design did not include similar vendor efforts. APPENDIX H provides more detail on the vendor attribution. For the Agricultural segment, we did not find any Enbridge effect on vendors. Despite attempting a census of the 17 triggered vendors, our completed sample only included three vendors and five measures, which is too small of a sample to draw any long-term conclusions as to the broader Enbridge effect on vendors for this segment.

Table 3-1. Free-ridership-based attribution ratio for Industrial custom program*

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± at 90% confidence (FPC on)	Population m^3 savings	Percent population m^3 savings
Agricultural	62.52%	31	49	8%	30,754,095	48%
Industrial	64.19%	46	58	7%	32,772,861	52%
Industrial program overall	63.47%	77	107	6%	63,526,956	100%

* The table shows statistical precision (± at 90% confidence factor) that does include the effects of a finite population correction factor. See Appendix B for more information

[8] Enbridge's Annual Report provides a more detailed description of the program and can be found here: https://www.oeb.ca/sites/default/files/OEB-Annual-Report-2022-2023-EN.pdf

[9] *2023 Natural Gas Demand Side Management Custom Savings Verification.* Prepared for The Ontario Energy Board by DNV, November 25, 2024.

3.2 Components of free-ridership-based attribution

The FR-based attribution rate for each measure is calculated based on participant survey responses to questions regarding the utility's influence on the timing, quantity, and efficiency of the measure installed. This section reports the program's effect on each component and provides an indication of which aspects of the projects show the greatest utility influence.

Throughout this section, a "Null" value in the table reflects less than five customer responses. For confidentiality reasons, results for less than five responses are not displayed. Customers with more than one installed measure and different survey responses by measure will appear multiple times in the table, resulting in a customer total greater than the number of customers interviewed.

Note that while the ratios in Table 3-1 include vendor influence in the Agricultural segment, tables in this section only provide insight into participant responses and do not incorporate vendor influence.

Table 3-2 represents the possible combinations of timing, efficiency, and quantity attribution. A "yes" in the timing, efficiency, or quantity column indicates partial or full FR-based attribution for that source. A "no" indicates no FR-based attribution for that source. For example, the row that has "yes" for timing, efficiency, and quantity reports the portion of the sample that indicated that the program had at least partial influence on the timing, efficiency, and quantity for that measure. For some measures, efficiency or quantity may not be applicable questions; for the purposes of this table, the not applicable measures are included as "no" on the non-applicable dimension.

The table shows the number of customers, measures, and savings that fall into each timing, efficiency, and quantity combination. The percentage of sample weighted cumulative savings shows the portion of population savings represented by that category.

The table shows that approximately the majority (76%) of program savings were at least partially influenced by the utility. Timing is the most common reflection of program influence, with respondents reporting that approximately 60% of the program savings were accelerated by the program. Efficiency affects approximately 45% of the program savings, and the program influenced quantity for approximately 20% of program savings.

Table 3-2. Overview of the sources of attribution for Industrial custom program*†

Timing	Efficiency	Quantity	Sample Custs	Sample Meas	Percent of Weighted M3
Yes	Yes	Yes	8	10	10%
		No	20	24	20%
	No	Yes	5	5	8%
		No	24	25	22%
No	Yes	Yes	Null	Null	1%
		No	16	17	14%
	No	Yes	Null	Null	1%
		No	19	23	24%

Partial or Full Attribution No Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
† The study team attempted to explore vendor influence for Ag, but the completed sample was too small to draw any conclusions from.

3.2.1 Timing component

Respondents answered a sequence of questions that addresses the timing of the equipment installation. (See APPENDIX K for the full survey instrument.) First, respondents answered the likelihood of installing the same type of equipment at the same time without the program (DAT1a). Respondents who answered "Later" specified the number of months later in the next question (DAT1b).[10] During the acceleration period, the energy savings for early replacement installations includes additional savings credit, which reflects the utility-influenced replacement of older, less efficient equipment.

The timing component was strongly influenced by the utility. More than 34 customers, accounting for 40% of program savings, said they would have installed their measure(s) at the same time. Projects representing approximately 38% of savings received full attribution by answering that they either never would have installed the measure (17% of savings), would have delayed the project by 48 months or more (4% of savings), or would have delayed the project by between 24 months and 48 months (17%). The remaining 22% of savings received partial timing attribution (Table 3-3).

[10] See the Scope of Work attached in APPENDIX H for the detailed scoring algorithm.

Table 3-3. Determining the acceleration period, Industrial custom programs*†‡

DAT1a. Without the utility when would you have performed the measure?
DAT1b. Approximately how much later?

DAT1a	DAT1b	Timing Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same Time	N/A	0%	34	43	40%
Later	Months <24	ER baseline credit for months accelerated	14	15	16%
	24≤ Months <48	100% ER baseline credit	16	18	17%
	Months ≥48	100% ER baseline credit	5	5	4%
	Don't Know/Refused	ER baseline credit for avg. of DAT1b	5	7	6%
Never	N/A	100%	16	19	17%

No Timing Attribution Full or Partial Timing Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
†ER is an acronym for early replacement. N/A represents not applicable.
‡ The study team attempted to explore vendor influence for Ag, but the completed sample was too small to draw any conclusions from.

3.2.2 Efficiency component

Respondents answered a sequence of questions that address the utility's influence on the efficiency level of the installed equipment. (See APPENDIX K for the full survey instrument.) First, respondents were asked whether they would have installed the same level of efficiency without the utility (DAT2a). Respondents who answered that they would have installed a less efficient option answered two follow-up questions: first "what would you have installed," (DAT2c) followed by the scored follow-up question (DAT2b) to put their answer into a predetermined category. DAT2c was used to confirm the responses to DAT2b.

The utility's influence on efficiency is shown in Table 3-4. Respondents representing 38% of savings said the utility had no influence on the efficiency level of the equipment installed. Respondents who indicated the utility improved the efficiency level of their measures accounted for approximately 41% of program savings.

Table 3-4. Determining efficiency attribution, Industrial custom program*†‡

DAT2a. Without the utility, would you have installed the same efficiency, lesser or greater?
DAT2b. What efficiency would you have installed?

DAT2a	DAT2b	Efficiency Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same	N/A	0%	29	35	38%
Lower	Baseline Efficiency	100%	18	22	21%
	Between Baseline and Installed Efficiency	50%	19	21	14%
	Don't Know/Refused	Average of Dat2b	6	6	6%
Don't Know/Refused	N/A	Average of dat2a	Null	Null	3%
Not Applicable	N/A	Not Asked	19	20	18%

No Efficiency Attribution Full or Partial Efficiency Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
† N/A represents not applicable.
‡ The study team attempted to explore vendor influence for Ag, but the completed sample was too small to draw any conclusions from.

3.2.3 Quantity component

Respondents answered a sequence of questions that addressed the utility's effects on the quantity or size of the equipment installed. (See APPENDIX K for the full survey instrument.) First, respondents were asked whether they would have installed the same amount of equipment (or capacity for measures for which quantity is less relevant, such as boilers) without the utility (DAT3a). Respondents who answered that they would have installed less (or in some cases more/larger) equipment answered a follow-up question (DAT3b) to specify how the utility changed the amount/size that they installed.

The program had limited influence on the quantity of measures installed. Forty-one customers, accounting for 37% of program savings, said they would have purchased the same quantity of equipment without the program (Table 3-5). Customers representing 20% of program savings received partial attribution. Another 43% of savings were from measures for which quantity is not applicable. Examples of not applicable measures include building automation systems, a roof or a system optimization.

Table 3-5. Determining quantity/size attribution, Industrial custom program*†‡

DAT3a. Without the utility would you have installed the same amount, more or less?
DAT3b. What amount would you have installed?

DAT3a	DAT3b	Quantity Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same	N/A	0%	41	45	37%
Less/Fewer/Smaller	Don't Know/Refused	Average of dat3b	Null	Null	4%
	Partial change	0%<Value<100%	5	6	6%
None	N/A	100%	7	9	10%
Not Applicable	N/A	Not Asked	36	44	43%

No Quantity Attribution Full or Partial Quantity Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
† N/A represents not applicable.
‡ The study team attempted to explore vendor influence for Ag, but the completed sample was too small to draw any conclusions from.

3.3 Vendor attribution

Evaluation interviews with the Enbridge program teams indicated that the program design for the Agricultural segment focuses on working with and influencing vendors who in turn influence customers in their DSM project decisions. Since the Industrial segment is focused on selling DSM directly to customers, not through influencing vendors, it was decided in consultation with the EAC to focus vendor survey resources on designing an approach specific to the Agricultural segment.

The FR participant interviews included a series of framing questions that served to help respondents think through the decision-making process for their projects. Through the responses to these questions, the interview was able to identify projects where a vendor played a role in the decision making. This data was collected for each program and was used to trigger vendor interviews in the Agricultural segment.

Across all programs and segments, vendors play a role in the decision making for most projects. This indicates that there could be opportunity for programs to increase net savings through proactively working with vendors as is the case with these segments' program strategy.

Table 3-6 and Table 3-7 show the vendor interview triggers for Industrial program segments.

Table 3-6. Vendor interview trigger for Custom Industrial – Agricultural programs

Vendor Involvement	Participant Attribution	Vendor Interview	Vendor Complete	Sample Customers	Sample Measures
Not Involved in Decision	100% Participant Attribution	Did not attempt vendor interview	N/A	2	3
	Less than 100% Participant Attribution	Did not attempt vendor interview	N/A	4	5
Involved in Decision	100% Participant Attribution	Did not attempt vendor interview	N/A	13	20
	Less than 100% Participant Attribution	Attempted vendor interview	N/A	14	16
			Completed Vendor Interview	3	5

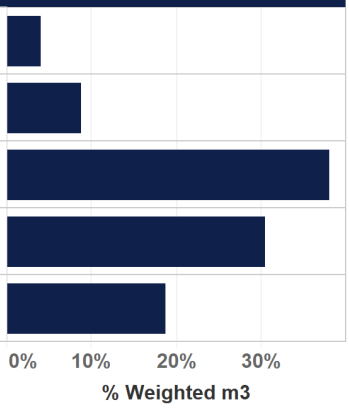
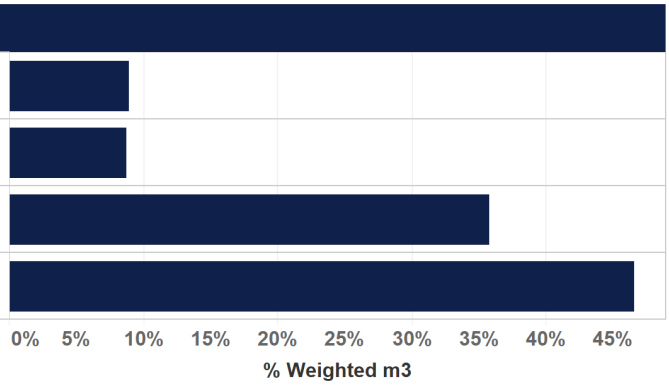


Table 3-7. Vendor interview trigger for Custom Industrial – Industrial program

Vendor Involvement	Participant Attribution	Sample Customers	Sample Measures
Not Involved in Decision	100% Participant Attribution	6	6
	Less than 100% Participant Attribution	8	8
Involved in Decision	100% Participant Attribution	15	19
	Less than 100% Participant Attribution	22	25



For the Agricultural segment, we did not find any Enbridge effect on vendors. Despite attempting a census of the 17 triggered vendors, our completed sample only included three vendors and five measures, which is too small of a sample to draw any long-term conclusions as to the broader Enbridge effect on vendors for this segment. The results of these surveys were not incorporated into the FR rate for the Agricultural segment.

3.4 Agricultural Spillover Study

The Agricultural segment spillover study captured both participant and non-participant spillover in a single ratio through a general population survey. The spillover ratio represents the ratio of market savings influenced by Enbridge outside the program to the savings in the program. A 10% spillover ratio indicates that the program influenced an additional 10% of program savings beyond what was captured in the program.

$$Spillover = \frac{Utility\ influenced\ savings\ outside\ the\ progam}{Program\ savings}$$

Table 3-8 shows the spillover ratio for the Enbridge agricultural segment, including the spillover ratio relative to program savings, spillover ratio relative to consumption, and estimated statistical precision at the 90% confidence interval as well as the total 2023 spillover found in m^3.

The study attempted a census of all 2023 customers targeted by the Enbridge agricultural custom offering team. The ratio result is based on an overall sample size of 105 customers and 143 accounts from a population of 322 customers and 425 accounts. Additional details on stratification, sample size, and population size are provided in APPENDIX J.

The study found an 15% of annual m^3 program savings as spillover (4,599,439 m^3) for the Enbridge Agricultural program. Approximately 10% was from direct sources of Enbridge influence, and approximately 5% was from indirect sources. The spillover found was approximately 0.5% of annual consumption for the program's target population. The savings found are reasonable for a program that is intensively targeting a small population through many different paths of influence and is already capturing roughly 50% market share of the savings occurring. Non-participant spillover studies tend to have wide error bounds due to the high amount of variability with many sites of all sizes having no spillover and many sites having some spillover of various amounts. The precision of the study showed that spillover is statistically greater than zero and as expected has a wide error bound that is just smaller than the ratio itself.

Table 3-8. Agricultural Segment Spillover ratio results – m^3

M^3 Results	Spillover ratio	Sample customers	Sample sites	± at 90% confidence (FPC on)	Population m^3 spillover savings
Spillover relative to program savings - all sources	14.96%	105	143	11.91%	4,599,439
Spillover relative to consumption - all sources	0.54%	105	143	0.43%	4,599,439
Spillover relative to program savings - direct sources	9.88%	105	143	11.31%	3,037,197
Spillover relative to program savings - indirect sources	5.08%	105	143	3.51%	1,562,243

The study also estimated spillover for lifetime m3 savings, or cumulative cubic meters (CCM). The study found an 11% of CCM program savings as spillover (53,357,251) for the Enbridge Agricultural program. Approximately 9% of lifetime was from direct sources of Enbridge influence, and approximately 2% was from indirect sources. The lifetime spillover found was approximately 6.3% of annual m3 consumption for the program's target population. The spillover savings are a lower percent of program savings for lifetime savings than for annual savings since the spillover measure savings on average came from measures with shorter measure lives than program measures.

Table 3-9. Spillover ratio results – CCM

CCM results	Spillover ratio	Sample customers	Sample sites	± at 90% confidence (FPC on)	Population CCM spillover savings	Percent population CCM spillover savings
Spillover relative to program savings - all sources	11.21%	105	143	9.83%	53,357,251	100.0%
Spillover relative to consumption - all sources	6.30%	105	143	5.52%	53,357,251	100.0%
Spillover relative to program savings - direct sources	8.75%	105	143	9.68%	41,651,079	78.1%
Spillover relative to program savings - indirect sources	2.46%	105	143	1.48%	11,706,172	21.9%

3.5 Detailed results

Table 3-10 shows the results of the first steps in identifying spillover projects; namely, which respondents made changes to their facilities, which of those changes saved gas, and which of the gas savings are outside of the Enbridge program. The study found that sites representing 55% of consumption made changes to their facility and 44% made changes that saved gas. Sites representing 40% of consumption made changes that saved gas outside of the program.

Table 3-10. Reported changes to facilities

Change	Sample customers	Sample sites	Weighted m^3 consumption	Percent m^3 consumption
All sites	105	143	854,820,545	100.0%
Any changes	72	81	466,723,788	54.6%
Saved gas	60	68	371,897,723	43.5%
Saved gas with non-program measures	52	60	339,578,057	39.7%

Table 3-11 and Table 3-12 show the same information as Table 3-10, but separate the results for 2023 custom program participants and 2023 non-participants.[11] Participants representing 69% of participant consumption reported making changes. For non-participants, respondents representing 50% of consumption reported making changes.[12]

Table 3-11. Reported changes to facilities – 2023 program participants

Change	Sample customers	Sample sites	Weighted m^3 consumption	Percent of participant m^3 consumption
All 2023 program participants	21	26	201,891,868	100.0%
Any changes	16	19	139,617,137	69.2%
Saved gas	15	18	137,819,779	68.3%
Saved gas with non-program measures	7	10	105,500,113	52.3%

[11] Note that five customers had both participating and non participating sites, so Table 2-4 and Table 2-5 total to more customers than reported in Table 2-3.

[12] While 100% of participants had a change reported in the program tracking data, not all of the projects in a program year were completed in the calendar year of the program.

Table 3-12. Reported changes to facilities – 2023 Program Non-participants

Change	Sample customers	Sample sites	Weighted m^3 consumption	Percent of non-participant m^3 consumption
All 2023 program non-participants	89	117	652,928,677	100.0%
Any changes	57	62	327,106,651	50.1%
Saved gas	46	50	234,077,944	35.9%
Saved gas with non-program measures	46	50	234,077,944	35.9%

The spillover study provided an estimate of the size of the market for gas savings from measures implemented in the Agricultural segment, which is approximately 62,000,000 annual m^3. Figure 3-1 shows that the Enbridge influenced savings make up 38% of the market (blue wedges), while program incentives are funding 50% of the market (dark green and dark blue wedges.

Figure 3-1. Gas savings market overall

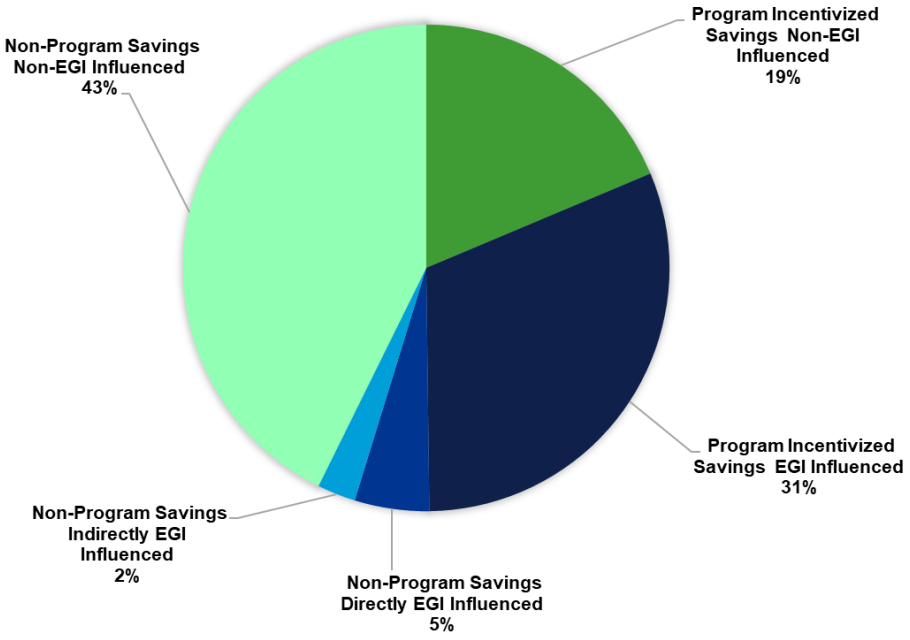


Table 3-13 shows the distribution of non-Enbridge program savings across measure type. Sites and customers could report multiple measures. The greatest savings were found for production increases. Production increases resulted from actions taken by sites such as changing configurations, changes to climate systems and/or lighting, and changes in varietals. The next biggest source of savings was energy curtains, with climate systems installation the third largest source.

Table 3-13. Non-Program savings by measure type

Measure type	Sample customers	Sample sites	Reported measures	Weighted m^3 savings	Percent weighted m^3 savings
Production increase	28	32	32	18,577,990	59.9%
Greenhouse energy curtains for roof	9	9	9	2,993,858	9.7%
Climate control upgrades	7	7	7	2,535,480	8.2%
Climate or system controls	7	7	7	1,663,771	5.4%

Measure type	Sample customers	Sample sites	Reported measures	Weighted m^3 savings	Percent weighted m^3 savings
Boiler controls	4	4	4	1,046,667	3.4%
Boiler/furnace	7	7	7	935,255	3.0%
Wall insulation	6	6	6	538,323	1.7%
Equipment for ag process, e.g. biomass combustor, optimization	1	1	1	389,987	1.3%
Boiler/furnace tune-ups	16	17	17	375,734	1.2%
Boiler economizer	3	3	3	315,935	1.0%
Roof insulation	3	3	3	256,201	0.8%
CO_2 condenser	2	2	2	240,122	0.8%
Loading dock door sealing	4	4	4	230,576	0.7%
Doors	4	4	4	230,576	0.7%
Boiler system insulation - pipes	4	4	4	125,710	0.4%
Greenhouse vent seals	2	2	2	120,034	0.4%
Boiler system insulation – fittings	3	3	3	99,168	0.3%
Burner upgrades or new installs	3	3	3	73,201	0.2%
Destratification fans	1	1	1	65,982	0.2%
Windows	4	4	4	56,377	0.2%
Heating system upgrade from steam to hot water	1	1	1	45,940	0.1%
Boiler system insulation - tank	2	2	2	43,591	0.1%
Other heat recovery	2	2	2	38,254	0.1%
Greenhouse glazing for walls	1	1	1	9,388	0.0%

Table 3-14 shows the specific influences on the non-Enbridge program gas savings. Respondents could select more than one source of influence. Expansion and prior experience with the measure are the most significant influences, with respondents representing 45% and 33% of savings citing them.

Table 3-14. Influences on non-Enbridge program gas savings

Enbridge influence on non-program gas savings	Specific source	Sample customers	Sample sites	Reported measures	Weighted m^3 savings	Percent weighted m^3 savings
None	Company growth, expansion, or other business operation reasons	27	27	63	13,983,993	45.1%
	Prior experience with equipment	17	19	27	10,088,366	32.5%
	Routine upgrade schedule/plans	25	27	31	8,161,960	26.3%
	Company policies	12	12	15	5,913,044	19.1%
	Other	6	10	11	4,687,012	15.1%
	Equipment failed or at end of useful life	8	8	15	3,826,619	12.3%
	Non-EGI program incentive	1	2	2	222,157	0.7%
Direct source	Prior Enbridge conservation program experience	9	10	16	4,698,904	15.2%
	Conversations, consultation, or advice from Enbridge reps	10	11	24	4,590,418	14.8%
	Enbridge advertising, workshops, seminars, training, and/or education	5	5	11	3,937,291	12.7%

Enbridge influence on non-program gas savings	Specific source	Sample customers	Sample sites	Reported measures	Weighted m^3 savings	Percent weighted m^3 savings
Indirect source	Consulting done by vendors, contractors, design firms, consultants, or other third parties	13	13	26	7,353,094	23.7%
	Word of mouth/other person's experience	15	17	25	4,896,058	15.8%
	Audits (to reduce gas use)	8	8	13	4,744,606	15.3%
	Trade show presentation/booth	3	3	9	3,245,208	10.5%
	Submetering, feasibility, or other studies	3	3	4	3,220,409	10.4%
	Publications or case studies	3	3	4	2,729,787	8.8%

Table 3-15 shows the final Enbridge influence on non-Enbridge program gas savings. The final influence for a measure was scored as direct influence if the respondent indicated at least one direct Enbridge source of influence. It was scored as indirect influence if the respondent did not cite any direct influences and indicated at least one indirect source of influence. Respondents representing 64% of weighted savings indicated no Enbridge influence on the measures implemented, while 17% of savings had direct influence and 19% had indirect influence.

Table 3-15. Final scored Enbridge Influence on non-Enbridge program gas savings

Enbridge influence on non-program gas savings	Sample customers	Sample sites	Reported measures	Weighted m^3 savings	Percent weighted m^3 savings
None	31	37	77	19,886,797	64.1%
Direct source	12	13	26	5,104,899	16.5%
Indirect source	21	22	26	6,016,427	19.4%

4 LARGE VOLUME

Enbridge encourages the adoption of energy efficient equipment, technologies, and actions via its Large Volume program. The Large Volume program in 2023 was applicable to customers in Rate T2/Rate 100 in the Union rate zones.

The program uses a direct access budget mechanism for the customer incentive budget process. This mechanism collected funds from each customer through rates. Customers must use these funds to identify and implement energy efficiency projects, or the funds become can be used by other customers in the same rate class. This "use it or lose it" approach ensures each customer has first access to the amount of incentive budget funded by their rates. The Large Volume program is the only "direct access" program offered in Ontario.[13]

Custom projects implemented as part of this program and claimed in 2023 were included in this study.

4.1 Free-ridership-based attribution rate

The FR-based attribution ratio represents the ratio of the savings influenced by the utility (considering only free-ridership, not spillover) to the savings verified by the evaluation, as shown in the following equation. The methods used to determine evaluation verified savings are presented in a separate report.[14] A 90% FR-based attribution ratio means the utility influenced savings (considering only free-ridership) were 90% of the evaluation verified savings.

$$free-ridership-based\ attribution = \frac{Utility\ influenced\ savings\ considering\ only\ free-ridership, not\ spillover}{Evaluation\ verified\ savings}$$

Table 4-1 shows the FR-based attribution ratio for the Large Volume program. The table shows the FR-based attribution ratio, statistical precision at the 90% confidence interval, the program-claimed population first year m^3 savings, and percent of program savings.

The ratio result is based on an overall sample size of 14 customers and 20 measures. Additional details on stratification, sample size, and population size are provided in APPENDIX D. Additional statistical details for the results are provided in APPENDIX G.

The Large Volume program had the lowest FR-based attribution among the three programs. This program faces unique challenges to increasing attribution, including the direct access budget mechanism, low gas rates for participating customers, and measures that typically address maintenance concerns. The result is often projects with very low or very high simple payback periods, which often have low FR-based attribution.

Table 4-1. Free-ridership-based attribution ratio for Large Volume *

Segment	Sample customers	Sample measures	Free-ridership-based attribution	± at 90% confidence (FPC on)	Population m3 savings	Percent population m3 savings
Large Volume Program Overall	14	20	27.95%	4%	80,549,726	100%

* The table shows statistical precision (± at 90% confidence factor) that does not include the effects of a finite population correction factor. See APPENDIX B for more information.

[13] Enbridge's Annual Report provides a more detailed description of the program and can be found here: https://www.oeb.ca/sites/default/files/OEB-Annual-Report-2022-2023-EN.pdf

[14] *2023 Natural Gas Demand Side Management Custom Savings Verification.* Prepared for The Ontario Energy Board by DNV, November 25, 2024.

4.2 Components of free-ridership-based attribution

The FR-based attribution rate for each measure is calculated based on participant survey responses to questions regarding the utility's influence on the timing, quantity, and efficiency of the measure installed. This section reports the program's effect on each component and provides an indication of which aspects of the projects show the greatest utility influence.

Throughout this section, a "Null" value in the table reflects less than five customer responses. For confidentiality reasons, results for less than five responses are not displayed. Customers with more than one installed measure and different survey responses by measure will appear multiple times in the table, resulting in a customer total greater than the number of customers interviewed.

Table 4-2 represents the possible combinations of timing, efficiency, and quantity attribution. A "yes" in the timing, efficiency, or quantity column indicates partial or full FR-based attribution for that source. A "no" indicates no FR-based attribution for that source. For example, the row that has "yes" for timing, efficiency, and quantity reports the portion of the sample that indicated that the program had at least partial influence on the timing, efficiency, and quantity for that measure. For some measures, efficiency or quantity may not be applicable questions; for the purposes of this table, the not applicable measures are included as "no" on the non-applicable dimension.

The table shows the number of customers, measures, and savings that fall into each timing, efficiency, and quantity combination. The percentage of sample sample-weighted cumulative savings shows the portion of population savings represented by that category.

The table shows that over half of program participation (~57% of savings) was at least partially influenced by the utility. Timing is the most common reflection of program influence, with respondents reporting that approximately 39% of the program savings were accelerated by the program. The utility influenced the efficiency levels of approximately 20% of the savings and the quantity/size of approximately 18%.

Table 4-2. Overview of the sources of attribution for Large Volume*

Timing	Efficiency	Quantity	Sample Custs	Sample Meas	Percent of Weighted M3
Yes	Yes	No	Null	Null	17%
	No	No	5	5	22%
No	Yes	Yes	Null	Null	3%
	No	Yes	Null	Null	15%
		No	8	10	43%

Partial or Full Attribution No Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.

4.2.1 Timing component

Respondents answered a sequence of questions that address the timing of the equipment installation. (See APPENDIX K for the full survey instrument.) First, respondents answered the likelihood of installing the same type of equipment at the same time without the utility (DAT1a). Respondents who answered "Later" specified the number of months later in the next

question (DAT1b).[15] During the acceleration period, the energy savings for early replacement installations includes additional savings credit which reflects the utility-influenced replacement of older, less efficient equipment.

Eight out of 14 surveyed customers, accounting for 61% of program savings, said they would have installed their measure(s) at the same time. Customers representing approximately a third of savings indicated some amount of utility acceleration on at least one measure, mostly between 1 and 24 months (Table 4-3).

Table 4-3. Determining the acceleration period, Large Volume*†

DAT1a. Without the utility when would you have performed the measure?
DAT1b. Approximately how much later?

DAT1a	DAT1b	Timing Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same Time	N/A	0%	8	13	61%
Later	Months <24	ER baseline credit for months accelerated	Null	Null	33%
	Don't Know/Refused	ER baseline credit for avg. of DAT1b	Null	Null	0%
Never	N/A	100%	Null	Null	5%

No Timing Attribution Full or Partial Timing Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
†ER is an acronym for early replacement. N/A represents not applicable.

4.2.2 Efficiency component

Respondents answered a sequence of questions that address the utility's influence on the efficiency level of the installed equipment. (See APPENDIX K for the full survey instrument.) First, respondents were asked whether they would have installed the same level of efficiency without the utility (DAT2a). Respondents who answered that they would have installed a less efficient option answered two follow-up questions: first "what would you have installed," (DAT2c) followed by the scored follow-up question (DAT2b) to put their answer into a predetermined category. DAT2c was used to confirm the responses to DAT2b.

The utility had less influence on efficiency than timing, partially affecting 19% of the program savings (Table 4-4). Over three-quarters of program savings received zero efficiency attribution.

[15] See the Scope of Work attached in APPENDIX H for the detailed scoring algorithm.

Table 4-4. Determining efficiency attribution, Large Volume*†

DAT2a. Without the utility, would you have installed the same efficiency, lesser or greater?
DAT2b. What efficiency would you have installed?

DAT2a	DAT2b	Efficiency Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same	N/A	0%	10	13	54%
Lower	Baseline Efficiency	100%	Null	Null	5%
	Don't Know/Refused	Average of Dat2b	Null	Null	3%
Don't Know/Refused	N/A	Average of dat2a	Null	Null	11%
Not Applicable	N/A	Not Asked	Null	Null	26%

No Efficiency Attribution Full or Partial Efficiency Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
† N/A represents not applicable.

4.2.3 Quantity component

Respondents answered a sequence of questions that addressed the utility's effects on the quantity or size of the equipment installed. (See APPENDIX K for the full survey instrument.) First, respondents were asked whether they would have installed the same amount of equipment (or capacity for measures for which quantity is less relevant, such as boilers) without the utility (DAT3a). Respondents who answered that they would have installed less (or in some cases more/larger) equipment answered a follow-up question (DAT3b) to specify how the utility changed the amount/size that they installed.

The utility had little influence on the quantity of measures installed. Seven customers, accounting for 28% of the program savings, said they would have purchased the same amount of equipment without the utility (Table 4-5). Eighteen percent of savings were influenced by the utility, while 54% were from measures for which quantity is not applicable. Examples of not applicable measures include building automation systems, a roof or a system optimization.

Table 4-5. Determining quantity/size attribution, Large Volume*†

DAT3a. Without the utility would you have installed the same amount, more or less?
DAT3b. What amount would you have installed?

DAT3a	DAT3b	Quantity Attribution	Sample Custs	Sample Meas	Percent of Weighted M3
Same	N/A	0%	7	8	28%
Less/Fewer/Smaller	Partial change	0%<Value<100%	Null	Null	18%
Not Applicable	N/A	Not Asked	7	9	54%

No Quantity Attribution Full or Partial Quantity Attribution

* Because of confidentiality reasons and "Null" table entries, the sum of sample customers and sample measures in this table may not match the sum of sample customers and sample measures in other tables.
† N/A represents not applicable.

4.3 Vendor attribution

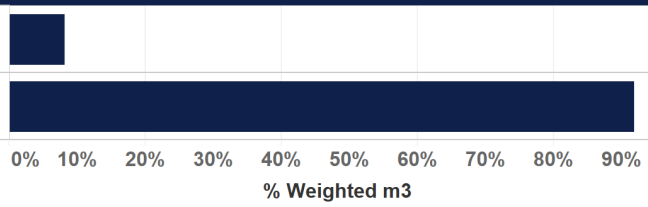
Evaluation interviews with the Enbridge program teams indicated that the program design for the Large Volume segment does not focus on working with and influencing vendors who in turn influence customers in their DSM project decisions. Vendor surveys were not completed for this Large Volume customers.

Across all programs and segments, vendors play a role in the decision making for most projects. This indicates that there could be opportunity for programs to increase net savings through proactively working with vendors as is the case with these segments' program strategy.

Table 4-6 shows that most projects in the Large Volume program indicated that a vendor was involved in their decision making on the project.

Table 4-6. Vendor interview trigger for Large Volume

Vendor Involvement	Participant Attribution	Sample Customers	Sample Measures
Involved in Decision	100% Participant Attribution	2	2
	Less than 100% Participant Attribution	12	18



5 FINDINGS AND RECOMMENDATIONS

Table 5-1 presents the key findings and recommendations from the study. The table shows the party to whom the recommendation applies and the primary beneficial outcome of the recommendation. We classified outcomes into four categories: reduce costs, increase savings, increase (or maintain) customer satisfaction, and decrease risk (multiple types of risk are in this category including risk of adjusted savings, risk to budgets or project schedules, and others). Details of the findings, recommendations, and outcomes follow the table. All recommendations address energy savings and program performance.

Table 5-1. Recommendations summary table

#	Energy savings and program performance		Applies to		Primary beneficial outcome			
	Finding	Recommendation	Enbridge	Evaluation	Reduce costs	Increase savings	Customer satisfaction	Decrease risk
1	FR-based attribution in the programs is variable	Evaluate free-ridership for the programs annually and couple the free-ridership evaluation with process evaluation		✓		✓		
2	FR-based attribution for the programs came primarily through acceleration	Consider strategies to have greater impact on increasing efficiency and amount (where applicable) of measures	✓			✓		
3	Many customers with high FR report involving Enbridge late in the process	Consider strategies to reduce customers taking advantage of the rebate for projects that are already fully decided upon.	✓			✓		✓
4	Return on Investment is mentioned consistently by customers and vendors as a key metric	Continue emphasis on ROI effect of incentives with customers. Consider helping to quantify kWh, water and other non-energy benefits of projects to sell projects that do not pass ROI on gas savings alone	✓			✓		
5	Safety code requirements differ among commercial buildings can affect energy saving measures	Consider reviewing safety code requirements for facilities likely to have higher than typical code.	✓					✓
6	Reducing Carbon tax bills is a driver for some customers	Consider ways to leverage Carbon tax and Carbon effects as part of the package to motivate customers to participate	✓			✓		
7	The Large Volume program has high free ridership	Consider the high free-ridership within the context of the cost effectiveness of the program. High free rider programs can still deliver meaningful cost-effective net savings.		✓		✓	✓	
		Conduct a process evaluation to improve Large Volume influence on customer projects	✓			✓	✓	✓
		Consider limiting the measure types or payback periods that are eligible for Large Volume incentives	✓			✓	✓	✓

#	Energy savings and program performance		Applies to		Primary beneficial outcome			
	Finding	Recommendation	Enbridge	Evaluation	Reduce costs	Increase savings	Customer satisfaction	Decrease risk
8	Vendor attribution increased program attribution significantly for the Enbridge Commercial and Multifamily Segments	Consider expanding approaches to market for other programs that leverage third-party vendors.	✓		✓	✓		
9	Vendor attribution recruitment resulted in less completed interviews than desired.	Consider interviewing participating vendors independent of the participating customer sample and recruitment.		✓		✓		✓
10	In the attribution scoring methodology, timing assumptions, specifically the number of years assumed for "never would have implemented" have a significant effect on FR-based attribution.	Consider studying the typical planning horizons for each of the customer segments. The assumed planning horizon for companies is used in the scoring to determine at what point the program receives full influence credit for accelerating a measure's implementation.		✓				✓
11	The treatment of efficiency in the scoring has a relatively small effect FR-based attribution.	Consider simplifying the efficiency question sequence in future research to reduce survey length while still capturing attribution.		✓			✓	
12	A significant amount of spillover was found in the Agricultural segment.	Consider replicating the agriculture go-to-market approach in segments where it may provide similar results. In other customer groups this might be a combination of customer segmentation and specific measure type focus to achieve similar market effect in different niches.	✓			✓		
		Consider replicating the spillover study approach in segments where it may be applicable. Applicable segments include those with a strong program theory for market effects in a specific segment or segment-measure combination and those with known high market share for the program in an area.		✓		✓		
13	Data collection for the Agricultural segment spillover study was successful, with some areas for improvement.	The offered incentive and multi-modal survey approach led to higher than typical response rate for a general population study and should be considered for future research that includes non-participants.		✓	✓			✓
		Attempting to collect sufficient detail for site specific energy savings calculations provided marginal value and should be reconsidered.		✓	✓			

#	Energy savings and program performance		Applies to		Primary beneficial outcome			
	Finding	Recommendation	Enbridge	Evaluation	Reduce costs	Increase savings	Customer satisfaction	Decrease risk
		Adding a question about why customers did not go through the program could provide additional value in future studies of this type.		✓				✓
14	The spillover study found 14.96% annual m3 spillover and 11.21% lifetime CCM spillover.	The spillover found in the study should be applied to the agricultural custom offering results using the percent of program savings ratios.	✓	✓		✓		
		The separate annual and lifetime ratios should be applied to calculate the annual and cumulative savings respectively.	✓	✓		✓		
		The spillover found in this study should replace the value found in the 2015 participant survey as this study covers both participant and non-participant spillover.	✓	✓		✓		

Finding 1: FR-based attribution in the programs is variable.

- **Recommendation 1:** Consistent evaluation of free-ridership coupled with process evaluation will help identify specific ways for each program to manage and reduce free-ridership. Consistent measurement of free-ridership early in the next DSM framework can help Enbridge and stakeholders to understand what is working to drive net savings and provide lessons for continuous improvement.
- **Outcome 1:** Effective free-ridership management will allow the programs to continue to increase their net savings in future years.

Finding 2: FR-based attribution for the programs came primarily through acceleration rather than changes in efficiency or quantity. Acceleration periods tend to be considerably shorter than the estimated useful life (EUL) of a measure and thus the partial FR-based attribution that results is low relative to cumulative gross savings. Acceleration is less valuable to societal and provincial goals than changes in efficiency and quantity due to its short-term effect. Program goals in the current framework are first-year gas savings rather than cumulative savings, so this recommendation will not have a significant effect on program results.

- **Recommendation 2:** To ensure the programs continue to deliver significant cumulative net savings, the utilities should continue to:
  - Identify unique solutions that save energy at customer plants
  - Expand promotion of energy efficiency measures with low market penetration
  - Motivate customers to increase the scope of their projects. Some options include multi-measure bonuses or escalating incentive structures that pay more for doing more.
  - Promote long life measures and consider discontinuing the promotion of short-lived measures
  - Proactively upsell equipment purchases from standard to efficient products

  - Target hard -to-reach customers who have not participated in the past
  - Adopt lessons learned from the Enbridge Commercial and Multifamily approach to market, working proactively with vendors
  - Focus on promoting novel energy energy-saving solutions to industrial and agriculture customer problems. Several customers indicated that the project would not have happened without the utility because a utility representative identified a solution that they had not considered

  In addition, the utilities should stop providing incentives for standard efficiency products in non-replace on burnout situations.

- **Outcome 2:** Additional effect on efficiency and quantity of measures will increase net savings and hedge against regulatory risk if future frameworks revert to cumulative savings metrics.

Finding 3: Many customers with high FR report involving Enbridge late in the process.

- **Recommendation 3:** Consider strategies to reduce customers taking advantage of the rebate for projects that are already fully decided upon. The program has established proactive marketing and engagement strategies in place to be involved early in the process with many of the largest customers, which helps mitigate this risk. Increasing efforts and resources in order to expand these efforts to the broader mid-size customers could be an option.
- **Outcome 3:** Increasing proactive engagement approaches will reduce the percentage of free riders in the program and increase gross savings.

Finding 4: Return on Investment is mentioned consistently by customers and vendors as a key metric.

- **Recommendation 4:** Continue emphasis on ROI effect of incentives with customers. Consider increasing efforts to quantify kWh, water, and other non-energy benefits of projects to sell projects that do not pass ROI on gas savings alone.
- **Outcome 4:** Adding additional quantifiable impacts to sales pitches can help increase net savings, both through increased volume of gross savings and through more visible and memorable Enbridge support for making business case for DSM projects.

Finding 5: Safety code requirements differ among commercial buildings can affect energy saving measures.

- **Recommendation 5:** Consider reviewing safety code requirements for facilities likely to have higher than typical code. At least one participant referenced their measure as being required by code for their facility. Codes can vary across jurisdictions at different levels of government and may apply for some facilities and situations, but not others. Consider maintaining an internal tracker for situations where codes are higher and affect typical custom measures. Pipe insulation and steam trap jackets are two examples.
- **Outcome 5:** Keeping an internal tracker of codes that affect projects can help the program avoid free-rider projects and identify measures that are ready to be sunset or limited in the programs.

Finding 6: Reducing Carbon tax bills is a driver for some customers.

- **Recommendation 6:** Consider ways to leverage Carbon tax and Carbon effects as part of the package to motivate customers to participate. Carbon tax was cited by at least one customer as a significant driver for reducing gas use at the participating facility. While this presents a free-ridership risk, Enbridge can also use Carbon tax effects as a lever in ROI conversations and for making the business case.
- **Outcome 6:** Quantifying likely Carbon tax effects of DSM measures for customers can help grow the program and reduce free-ridership.

Finding 7: The Large Volume program has high free-ridership.

- **Recommendation 7a:** Consider the high free-ridership within the context of the cost effectiveness of the program. High free rider programs can still deliver meaningful, cost-effective net savings.
- **Outcome 7a:** The Large Volume program delivers significant net savings
- **Recommendation 7b:** Conduct a process evaluation to improve Large Volume influence on customer projects
- **Outcome 7b:** A process evaluation may uncover ways for Enbridge to drive net savings at Large Volume sites with less free-ridership.
- **Recommendation 7c:** Consider limiting the measure types or payback periods that are eligible for Large Volume incentives. Continuous maintenance projects and projects where payback is single digit months are projects that will generally get priority without program funds. Eliminating high potential free-ridership projects will enable additional funds to be targeted toward projects that require funding to get done. From a customer service standpoint, it is difficult for utilities to deny incentives to customers unless they have pre-established rules to point to. Clear rules can allow Enbridge to reject potentially poor projects without a large effect on customer satisfaction.
- **Outcome 7c:** Reducing free-rider projects will increase net savings.

Finding 8: Vendor attribution increased program attribution significantly for the Enbridge Commercial and Multifamily Segments. Participants of all programs indicated vendor involvement at key decision-making junctures, suggesting that if Enbridge is able to influence vendor recommendations, there may be an opportunity to increase indirect influence on participants in all segments.

- **Recommendation 8:** The utilities should consider what lessons can be learned from the Enbridge multifamily approach to market that is applicable to other segments. All segments may have opportunities to leverage third-party vendors. A process evaluation that includes vendor interviews might uncover specific opportunities and approaches that would help in transferring the Enbridge multifamily lessons to other segments.
- **Outcome 8:** Effective leveraging of vendors could both increase FR-based attribution and program uptake.

Finding 9: Vendor attribution recruitment resulted in less completed interviews than desired.

- **Recommendation 9:** Consider interviewing participating vendors independent of the participating customer sample and recruitment. The current evaluation practice is to interview vendors that are identified as influential on customers through the participant interview, which ties the vendor and customer responses together, but also creates a challenge in project delivery since the vendor interviews cannot be started until late in participant data collection. An alternative approach would be to have an independent sample of projects to ask vendors about that could be completed in parallel with participant data collection.
- **Outcome 9:** Larger completed samples of vendors allowing for more robust estimates of Enbridge effect on vendor actions.

Finding 10: In the attribution scoring methodology, timing assumptions, specifically the number of years assumed for “never would have implemented” have a significant effect on FR-based attribution.

- **Recommendation 10:** Consider studying the typical planning horizons for Ontario businesses in each segment. Currently, the two-year and four-year assumptions offered are based more on anecdotal evidence than on data. The assumed planning horizon for companies is used in the scoring to determine at what point the program receives full influence credit for accelerating a measure’s implementation.
- **Outcome 10:** More accuracy and confidence in free-ridership-based attribution results.

Finding 11: The sensitivity testing shows that the treatment of efficiency in the scoring has a relatively small effect on free-ridership-based attribution.

- **Recommendation 11:** Consider simplifying the efficiency question sequence in future research to reduce survey length, while still capturing attribution.
- **Outcome 11:** Reduced customer burden during interviews.

Finding 12: A significant amount of spillover was found in the Agricultural segment.

- **Recommendation 12a:** Consider replicating the agriculture go-to-market approach in segments where it may provide similar results. In other customer groups this might be a combination of customer segmentation and specific measure type focus to achieve similar market effect in different niches.
- **Recommendation 12b:** Consider replicating the spillover study approach in segments where it may be applicable. Applicable segments include those with a strong program theory for market effects in a specific segment or segment-measure combination and those with known high market share for the program in an area.
- **Outcome 12:** Increased savings through market effects.

Finding 13: Data collection for the Agricultural segment spillover study was successful, with some areas for improvement.

- **Recommendation 13a:** The offered incentive and multi-modal survey approach led to higher than typical response rate for a general population study and should be considered for future research that includes non-participants.
- **Recommendation 13b:** Attempting to collect sufficient detail for site specific energy savings calculations provided marginal value and should be reconsidered.
- **Recommendation 13c:** Adding a question about why customers did not go through the program could provide additional value in future studies of this type.
- **Outcome 13:** Improved value from future studies.

Finding 14: The spillover study found 14.96% annual m3 spillover and 11.21% lifetime CCM spillover. While the relative precision of the study showed high variability, this is a common feature of spillover studies generally and should not preclude applying the ratio to estimate net savings for the program.

- **Recommendation 14a:** The spillover found in the study should be applied to the agricultural custom offering results using the percent of program savings ratios.
- **Recommendation 14b:** The separate annual and lifetime ratios should be applied to calculate the annual and cumulative savings respectively.
- **Recommendation 14c:** The spillover found in this study should replace the value found in the 2015 participant survey as this study covers both participant and non-participant spillover.
- **Outcome 14:** Updated energy savings estimates for the program.

APPENDIX A. GLOSSARY OF TERMS AND KEY CONCEPTS

Term	Description
Action	A DSM measure that generates savings through optimization, maintenance, or repair of existing systems. Actions (vs. equipment) were categorized for the populations of measures based on tracking database information provided by Enbridge for sample design.
Adjustment factor	The adjustment factors are ratios of savings that allow evaluation findings from a sample of projects to be applied to and "adjust" the population of program savings. Realization rates and ratios are other common terms.
Attribution	The energy savings or other benefits that are the result of a utility energy program's influence, including free-ridership and spillover effects (see definitions in this Glossary).
Baseline, base case	Energy used / equipment in place if the program measure had not been done.
Building envelope	Exterior surfaces (e.g., walls, windows, roof, and floor) of a building that separate the conditioned space from the outdoors.
C&I	Commercial and Industrial
Capacity Expansion	Measure that allows customer to increase production/productivity
CCM	Cumulative cubic meters (cumulative m^3). In this report, represents the volume of natural gas savings verified over the life of the measure.
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.
Cost effectiveness	Refers to the analysis that determines whether or not the benefits of a project/measure (see Glossary) are greater than the costs. It is based on the net present value of savings over the equipment life of the measure.
Cost effectiveness test - PAC	A test that compares the utility's avoided cost benefits with energy efficiency program expenditures (incentives plus administrative costs).
Cost effectiveness test – TRC-Plus	A test that compares benefits to society as a whole (avoided cost benefits plus non-energy benefits) with the participant's cost of installing the measure plus the cost of incentives and program administration.
Custom project savings verification (CPSV)	Activities related to the collection, analysis, and reporting of data for purposes of measuring gross custom program impacts.
Customer	Unique customers can be identified based on the account number and the contact information provided by Enbridge. A customer may have multiple site addresses, decision makers, and account numbers. Customers can only be identified for records for which we received contact information. (i.e., records associated with account numbers that have measures in the sample or backup sample).
Demand side management (DSM)	Modification of perceived customer demand for a product through various methods such as financial incentives, education, and other programs.
Domain	Grouping of like projects. A domain may be defined as projects within a specific sector or a category of measure types, end uses, or other.

Term	Description
Dual baseline	Savings calculation approach which addresses or combines the savings associated with early replacement and the savings after the early replacement period. This concept is relevant to the measurement of lifetime gas savings (CCM) but not first-year annual savings.
Early replacement (ER)	Measure that replaces a piece of equipment that is not past its estimated useful life (EUL) and in good operating condition. 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).
Early replacement period (ER Period)	Time that the existing equipment would have continued to be in use. This is the same as remaining useful life (RUL). This concept is relevant to the measurement of lifetime gas savings (CCM) but not first-year annual savings.
Energy solutions advisor (ESA)	Energy Solutions Advisors work with customers on a one-to-one basis to address the unique processes and opportunities within each customer facility, identify energy savings opportunities, and promote Enbridge's DSM offerings.
Estimated useful life (EUL)	The length of time that a measure (see definition in Glossary) is expected to provide its estimated annual gas savings. EUL depends on equipment lifetime and measure persistence (see Glossary definition). Typically, the median number of years that the measure will remain in service.
Ex ante	Program claimed or reported inputs, assumptions, savings, etc.
Ex post	Program inputs, assumptions, savings, etc. which are verified after the claimed savings are finalized. Does not include assessment of program influence.
Free rider	A customer who would install or perform the same energy-saving measure (see definition in Glossary) without utility influence.
Free-ridership	The portion of a program's verified energy savings that would naturally occur without the utility program.
Free-ridership-based attribution	The portion of a program's verified energy savings that the utility influenced if one only considers free-ridership and not spillover. Free-ridership-based attribution is the complement of free-ridership. (Free-ridership-based attribution = 100% - Free-ridership).
Gross savings	Gross savings are changes in energy consumption and/or demand directly caused by program-related actions by participants, regardless of reasons for participation (savings relative to baseline, defined above).
In situ	Existing measure, conditions, and settings.
In-depth interviews (IDIs)	Structured technical interviews administered by evaluation engineers and market researchers either in person or more frequently, over the phone, IDIs offer more flexibility than CATIs and are best leveraged for complex projects and topics.
Incentive	An incentive is often a payment from the utility to participants of a DSM program. Incentives can be paid to customers, vendors, or other parties.
Industry standard practice (ISP)	A common practice used within an industry but not formally defined by code or regulation.
Input assumptions	Assumptions such as operating characteristics and associated units of resource savings for DSM technologies and measures.
Lifetime cumulative savings	Total natural gas savings (CCM) over the life of a DSM measure. It can be claimed, gross, or net. Sometimes referred to as just "cumulative" or "lifetime."

Term	Description
Maintenance (Maint.)	Repair, maintain, or restore to prior efficiency.
Measure	Equipment, technology, practice, or behaviour that, once installed or working, results in a reduction in energy use. Measures are identified in the tracking data as unique line items for which savings within a custom project are quantified. Multiple measures may belong to the same project.
Measure persistence	How long a measure remains installed and performs as originally predicted in relation to its EUL. This considers events like business turnover, early retirement of installed equipment, and other reasons measures might be removed or discontinued.
Measurement and Verification (M&V)	Verification of savings using methods not including attribution/Free-Ridership assessment.
Metric	This is a term used by the OEB to measure a utility's program achievement. Under the DSM framework, programs are grouped into categories, called scorecards. Each program within a scorecard is assigned at least one metric that is used to measure utility performance. The metric for many programs is annual savings, or a reduction in natural gas consumption, while other programs have non-savings metrics such as the number of program participants. Within each scorecard, various metrics are combined to produce an overall scorecard achievement.
MF	Multifamily (multi-residential)
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. (see replace on burnout)
Net-to-gross	The ratio of net energy savings to gross savings. The NTG ratio is applied to gross program savings to convert them into net program savings.
New construction (NC)	New buildings or spaces, or a category of efficiency measures in new construction or major renovations, whose baseline would be the relevant code or standard market practice.
Non-early replacement period (non-ER period)	Time after the ER period up to the EUL.
Non-energy impacts	Sometimes called non-energy benefits, these are the wider socio-economic or environmental outcomes that arise from energy efficiency improvements, aside from energy savings. NEIs 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 NEIs.
Normal replacement (NR)	Measure that replaces a piece of equipment that is past EUL and in good operating condition.
Offering	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.
Persistence	The extent to which a DSM measure remains installed and performing as originally predicted in relation to its EUL.
Portfolio	A group of DSM programs which have been selected and combined in order to achieve the objectives of a utility's DSM Plan.

Term	Description
Program	The programs outlined in Enbridge's Multi-Year Plan are comprised of one or more offerings and address the needs of a subset of Enbridge's customer base.
Program evaluation	Activities related to the collection, analysis, and reporting of data for purposes of measuring program impacts from past, existing, or potential program impacts.
Program spending	The amount spent running energy-savings programs, not including the costs of running (called overhead costs) the larger portfolio of programs. This value can be divided into spending for program measures and incentives, as well as program-specific costs.
Project	Projects are identified in the tracking data based on the project code. A project may have multiple measures as indicated by sub-codes in the current data tracking system.
Rate class	The OEB establishes distribution rate classes for Enbridge. Distribution rate classes group customers with similar energy profiles.
Realization rate	A combination of adjustment factors, which represents ratios between two savings values. For example, the final realization rate is the ratio between evaluated savings and program claimed savings.
Remaining useful life (RUL)	The number of years that the existing equipment would have remained in service and in good operating condition had it not been replaced. This is the same as the ER period.
Replace on burnout (ROB)	Measure that replaces a failed or failing piece of equipment. (see natural replacement)
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.
Retrofit add-on (REA)	Measure that reduces energy use by modifying an existing piece of equipment.
Scorecard	A scorecard allows for multiple different kinds of metrics such as natural gas savings and/or participants enrolled to be used simultaneously to measure annual utility performance. Each utility has a scorecard identified for each program year, which can be found in the Ontario Energy Board Decision and Order EB-2021-0002.
Scorecard Achievement	The verified value for program-specific metric targets (annual savings, applications, etc.) of each scorecard identified by the Annual Scorecard. This is the value that is verified as the achieved value by the Annual Verification report and used for calculation of the shareholder incentive.
Shareholder Incentive	As part of the current DSM Framework, an annual performance incentive is available to the gas utilities in the event program performance is at or above 75% of the OEB-approved targets up to a maximum of 125%.
Site	Sites are identified based on unique site addresses provided by Enbridge through the contact information data request. A site may have multiple units of analysis, measures, and projects. Sites can be identified by the evaluation only for records for which we receive a site id.
Spillover effects	These are reductions in energy consumption and/or demand that occur as a result of the presence of a utility DSM program, but are beyond program-related savings and are not part of the utility's verified savings. These effects could result from many factors including additional efficiency actions that program participants take outside the program as a result of having participated, changes in store availability of energy-using equipment, and changes in energy use by program non-participants as a result of utility program advertising.
System optimization (OPT)	Improve system or system settings to exceed prior efficiency.

Term	Description
TRM	Technical Resource Manual, which is a document that identifies standard methodologies and inputs for calculating energy savings.
TSER	Telephone-supported engineering review.
Unit of analysis	The level at which the data are analyzed, which in 2023 will likely be a “measure” or sub-project level for Enbridge.
Vendors	Program trade allies, business partners, contractors, and suppliers who work with program participants to implement energy saving measures.

APPENDIX B. TECHNICAL INTRODUCTION

This study provides free-ridership-based attribution ratios from Enbridge's natural gas DSM programs delivered in 2023. The programs included are shown in Table B-1. In free-ridership-based attribution studies, Custom Market-Rate Multi-Residential (Multifamily) projects are included, but custom low-income multifamily (LI MF) projects are not. LI MF uses a deemed value for free-ridership.

Table B-1. FR by program, 2023

Program	2023 FR
Large Volume	✓
Commercial*	✓
Industrial	✓
Affordable Housing Multi-Residential	

*Custom Market-Rate Multi-Residential (Multifamily) projects are expected to be included as a part of this program.

Evaluation background

Enbridge delivers energy efficiency programs under the Demand Side Management Framework for Natural Gas Distributors (2023)[16] developed by the OEB. The OEB hired an Evaluation Contractor (EC) team led by DNV to develop an overall evaluation, measurement, and verification (EM&V) plan. The objectives of the plan were to:

- Assess portfolio impacts to determine annual savings results, shareholder incentive and lost revenue amounts, and future year targets.
- Assess the effectiveness of energy efficiency programs on their participants and/or market, including results on various scorecard items.
- Identify ways in which programs can be changed or refined to improve their performance.

Under the plan, the DNV team determined free-ridership-based attribution for custom projects implemented as part of the 2023 program year. This report is a result of that study.

The EAC consists of representatives from Enbridge as well as representatives from non-utility stakeholders, independent experts, staff from the Independent Electricity System Operator (IESO), and observers from the Environmental Commissioner of Ontario and the Ministry of Energy. The DNV team worked closely with the EAC throughout this study and received comment, advice, and input on methodology and results. We thank them for their involvement.

Methodology summary

The results presented in this report are based on data collection from the following four primary sources:

- Enbridge tracking databases
- Enbridge project documentation
- In-depth telephone interviews with a sample of participating customers
- In-depth telephone interviews with a sample of participating vendors

[16] EB-2021-0002

The data collection with samples of participating customers and vendors included telephone interviews focused on assessing free-ridership. Table B-2 shows the targeted and completed data collection activities.

Table B-2. Data collection activities*

Target Group	Activity	Targeted Measures	Completed Measures
Enbridge			
Participating Customers	In-Depth Interview	220	224
Participating Vendors	In-Depth Interview	Census of Triggered Comm & Multi-Res. And Ag Segments	31

*This table reports the number of measures targeted and completed as measures were used to design the sample before customers and sites had been identified.

At a high level, the FR study employed the following methodology:

- **Receive program data and documentation.** The evaluation started with a review of the program tracking data, which formed the basis of the sample.
- **Design and select the sample.** The tracking data was used to design and select a sample. Once the sample was selected, additional documentation was provided by the program to describe the energy efficiency measures to customers.
- **Collect data.** Data was collected to estimate FR-based attribution ratios.
- **Analyze the results.** The collected data was used to estimate FR-based attribution ratios at each site and expand the results to the population.
- **Report the results.** The final step was to report the results.

Key features of the methodology include:

- The **sample design** employed a stratified random sample that targeted 10% relative precision with 90% confidence at the program level. Details of the sampling methods are presented in the sample design memo in APPENDIX K. Final sample achievements are provided in APPENDIX D.[17]
- **Ratio estimation** was used to expand sample results to the population. The evaluation collected data on all sampled or backup projects that a customer contact could speak to rather than only the first selected. In our calculation of sampling error (±, confidence intervals, relative precision and error ratios), we used two-tailed 90% confidence limits and clusters defined by customers to appropriately estimate error when multiple units are collected from a single source.[18] The approach used is described in the scope of work in APPENDIX K.
- The **FR methodology** included data collection from participating customers and vendors. The data collection instruments and free-ridership scoring methods are provided with the scope of work in APPENDIX K. The results of this study include an update to the FR-based attribution portion of the net to gross (NTG) study performed on the 2018 programs.[19] The spillover calculations that will result from the 2023 Spillover study should be combined with the FR-based attribution results from this study to calculate the NTG ratio.

[17] This study was completed by DNV concurrent with the 2022-2023 Custom Savings Verification Study. Independent samples were selected for each study.

[18] Where a single site had two contacts, the site was used as a cluster to ensure conservative (higher) error estimates.

[19] *2018 Natural Gas Demand Side Management Free-ridership Based Attribution Evaluation*. Prepared for the Ontario Energy Board by DNV GL. March 13, 2020.

Key methodological changes from the 2017-18 NTG study

The evaluation followed the same framework as the 2017-18 NTG study, with several incremental improvements and adjustments.

1. The core approach focused on first-year gas savings rather than lifetime savings consistent with the DSM framework goals.
2. Interviews with customers occurred in two waves, the first wave was completed with customers who participated in the first three quarters of 2023 while the second wave was focused on the fourth quarter participants. This allowed for sooner after project completion interviews with both waves than was possible previously.
3. Framing questions were enhanced by utility provided documentation of several additional types of specific interactions prior to implementation of the project. These data were not used directly in scoring but allowed for more specific probes designed to improve customer recall of the project history.
4. Vendor interview approach was expanded to agriculture segment vendors.
5. Non-Commercial and Multifamily customer timing responses were assessed based on a 2-year planning horizon rather than 4 years. This change was in recognition of the fact that customers in these segments tend to have shorter planning horizons for equipment than industrial and agricultural customers. This meant that responses of 2-4 years of acceleration for projects were assessed as full credit to the program rather than partial. This approach is consistent with what was used for the Commercial and Multifamily customer timing credit in the 2017-2018 study

Understanding statistical error

Statistical error is reported for all ratio results in this report. The studies were designed with sample designs targeting 10% relative precision with 90% confidence (90/10) based on the best available assumptions at the start of the evaluation. Table B-3 describes each of the statistics provided in this report.

Table B-3. Relevant statistics

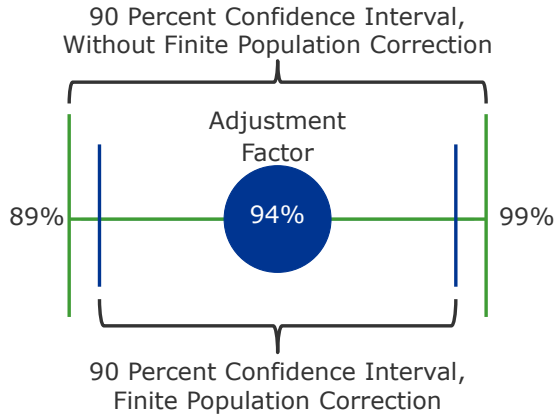
Term	Definition
Ratio/Adjustment factor	A point estimate of the evaluation findings expressed as a percent.
± or Absolute Precision	If the evaluation were repeated several times, selecting samples from the same population, 90%[20] of the time the ratio would be within this range of the ratio
Confidence interval	The upper bound is defined by the ratio plus the absolute precision. The lower bound is defined by the ratio minus the absolute precision.
Relative Precision	The relative precision is calculated as the absolute precision divided by the ratio itself. By convention, relative precisions are the statistic that are targeted in sampling (i.e., 90/10 is a relative precision metric)
Error Ratio	The error ratio is an approximation of the coefficient of variation (CV) that is used in sample design. It is calculated as a function of relative precision.
Finite population correction (FPC)	FPC is a factor that reduces the measured error of samples drawn from small populations (less than 300). FPC applies when the ratio is applied to the same population from which the sample was drawn. Statistics reported in the body of this report do not apply the FPC factor because this study is intended to support application of results to more than just the 2018 program year.

[20] 90% is the confidence limit that we are using.

Figure B-1 shows an example of:

- The adjustment factor (ratio) as a blue point
- The 90% confidence interval *with finite population correction* (blue)
- The 90% confidence interval *without finite population correction* (green)

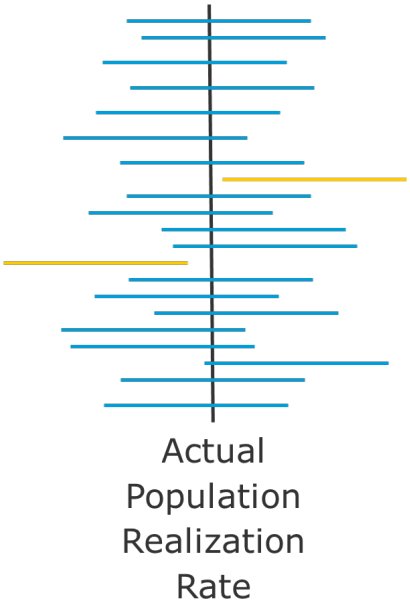
Figure B-1. Ratio diagram example



The plus/minus (±) error (%) indicated at the 90% confidence interval is the absolute difference between the estimated percentage and the upper or lower confidence bound. For example, in Figure B-1, the ratio is 94% and the non-FPC 90% confidence interval is ± 5 percentage points (i.e., 94% ± 5%).[21] Another way of saying this is that there is a 90% probability that the actual ratio for the next year's program lies between 89% and 99%. Figure B-2 demonstrates this concept by showing twenty hypothetical confidence intervals calculated from twenty different samples of the same population. Eighteen out of twenty (90%) include the true population ratio (overlap the black line representing the true ratio).

[21] The critical value for calculating the confidence interval ± for each adjustment factor is determined using Student's t-distribution and n-1 for the degrees of freedom, where n is the sample size. For two-tailed estimates (ratios that could be above or below 100%) the appropriate t-stat used to calculate precision from the standard error is close to 1.645.

Figure B-2. 90% confidence interval



Note: Each horizontal line represents a confidence interval, while the black vertical line is the actual population realization rate. Yellow confidence intervals do not include the actual ratio.

The relative precision of the ratio is calculated as 5%/94% = 5.3%.

For low ratios, relative precisions may be quite high, even when the confidence interval around the ratio is quite narrow. Consider a ratio of 5% with the same 5% absolute precision as in the above example. While the absolute precisions are the same, the latter ratio (5%) has a relative precision of 5%/5% = 100%. In absolute terms, we still are 90% confident the ratio is below 10%, despite the very high (100%) relative precision.

We reported the relative precision in all cases at the 90% confidence level. That is, whether the relative precision is large or small, we have the same 90% confidence that the range defined by the point estimate ± the absolute error captures the true unknown value. The “midpoint” estimate (the ratio) is the best (statistically most likely) estimate, while the confidence interval is calculated as an interval around that point. Thus, in all cases, we reported the best point estimate, with a symmetric 90% confidence interval (using the t-score for a two-tailed 90% confidence interval).

APPENDIX C. SPILLOVER STUDY BACKGROUND

The EAC's initial spillover discussions centered on a comprehensive study, looking at both participant and non-participant spillover across all custom projects. At the same time, there was concern regarding a study across market segments due to potential cost, complexity and complexity of spillover drivers across segments. DNV proposed to focus on the agricultural segment as it the greatest potential for quantifying a comprehensive spillover value. The EAC supported the proposal.

Choice of segment: The Enbridge Custom programs work to influence customers through multiple activities that differ somewhat across programs and offerings. The Agricultural segment was selected for this study due to three factors that made it a good candidate for quantifying spillover. First, the Agriculture segment program theory has spillover built in. For the Agricultural segment, Enbridge's program theory includes motivating energy efficiency through direct marketing to customers with ESAs and through broad outreach and marketing such as trade show/conference participation and sponsorship, magazines, and case studies. Second, the segment has a discrete list of technologies and measures that facilitate survey data collection, as opposed to wide-open questions that may result in greater non-response bias. Third, the segment has a substantial number of family-run businesses, which makes it more likely that account contacts associated with Enbridge billing are also knowledgeable about energy-using systems at the facilities.

Choice of spillover type: This study is designed to capture both non-participant and participant spillover (both like and non-like) in a single segment-wide spillover result.

As part of the program theory, spillover is anticipated to occur at participating sites with like/unlike spillover projects motivated by information from ESAs and experience with program-incentivized projects. Participant spillover was studied for the 2015 program year[22] and found to be 0.89% for the full industrial program, including, but not specific to the agricultural offering.

Non-participant spillover for the segment in a given year is expected to occur due to customers gaining insight and ideas for how to save gas from previous year Enbridge participation and sponsorship of trade shows and through word- of- mouth from participant experiences.

Approach: Enbridge provided a list of accounts with a full year of 2023 consumption who were targeted for the for the 2023 Enbridge Agricultural Custom offering. DNV attempted surveys with a census of these 423 sites. Customers representing 143 sites completed the survey. Both 2023 program participants and 2023 program non-participants were in included. Customers were asked about:

1. Whether they made changes made to gas use affecting systems in their facilities in 2023
2. What those changes were
3. What influenced their decision to make the change
4. What they would have done without the Enbridge-associated influences

From this data, DNV was able to estimate spillover savings for the Enbridge program. Survey results were translated into savings amounts using the savings per consumption ratio of measures completed in the 2023 custom agricultural program times the consumption for the surveyed site. The approach produced a reasonable savings amount, but is not expected to be accurate for each individual site. For sites that identified an increase in production due to a change in 2023, DNV asked by what percent production increased. This percent was multiplied by site consumption to approximate the savings.[23]

[22] DNV, *CPSV Participant Spillover Results*, May 23, 2018. https://www.oeb.ca/sites/default/files/OEB-CPSV-Participant-Spillover-Report.pdf

[23] In three cases, the production increase reported did not align with the changes made and DNV capped production increase savings at 25%.

APPENDIX D. FREE-RIDERSHIP FINAL SAMPLE ACHIEVEMENT

The tables in this appendix show the achieved sample for each stratum in the sample designs. The tables are specific to a program group and show the categorical stratification (grouping) and size strata (larger numbers are bigger projects). Sampling was done at the measure level. The target column shows the number of units we attempted to complete. The complete column shows the number of measures randomly selected and completed. First year natural gas savings (m^3) are also included under the header Ex Ante m^3. Note that in some cases measures beyond the target were completed. These completed measures were at sites with multiple measures in the sample.

Custom Commercial: Summary of participant data collected

Table D-1 summarizes the FR-based attribution data collection efforts for the Enbridge Custom Commercial program. The table shows the portion of the program that:

- Completed an in-depth interview
- Did not respond to an evaluation attempt at contact
- Was not contacted by the evaluation team[24]

The data collected in Table D-1 is shown as the number of customers and measures and the cumulative ex ante natural gas savings. The full sample design and achievement by strata can be found in Table D-2.

The evaluation collected FR-based attribution data for 34% of savings in the programs with a customer response rate of 13%.

Table D-1. Summary of FR data collection for Custom Commercial program

	Targeted	Completed		
Data collection category	# measures	# customers	# measures	Population m^3
Completed in-depth interview	100	83	97	9,221,576
Attempted contact, not completed		84	94	8,125,803
Not attempted		533	690	9,895,683
Total		651	881	27,243,062

[24] Sites, projects, or units of analysis where contact was not attempted were either not selected for contact in sampling or in the backup sample and were not contacted due to strata quotas being met.

Table D-2. FR sample achievement for Custom Commercial program

Segment	Measure Group	Stratum	Max M3	Target	Completed Measures	Completed M3	Population Measures	Total M3
Commercial	Boilers	1	10,767.4308	5	5	18,997	109	658,464
		2	19,008.9144	4	4	56,037	53	768,322
		3	36,359.7276	4	4	105,510	33	863,469
		4	107,134.66..	4	1	53,521	17	963,480
		5	108,377.83..	1	1	108,378	1	108,378
	Other Commercial	1	9,956.24	4	5	21,593	74	298,220
		2	16,507.78	4	4	45,006	28	358,142
		3	31,157.88	4	5	118,032	17	387,974
		4	54,855	4	3	133,196	11	476,436
		5	115,594.96	3	3	270,241	5	415,001
		6	211,110	2	1	138,696	2	349,806
	Steam Traps	1	36,660	2	2	34,540	12	191,738
		2	142,507	2	1	142,507	2	263,417
Institutional	Other Institutional	1	41,412.6	5	7	135,074	11	185,660
		2	70,162	4	4	238,891	5	301,617
		3	133,809	3	1	83,062	3	290,734
		4	167,308	1	1	167,308	1	167,308
		5	3,936,225	5	4	4,885,935	5	8,822,160
	Steam Traps	1	114,423	4	5	341,889	15	770,573
		2	406,048	2	2	527,488	2	527,488
Market Rate Multi-Family	Boilers	1	12,303.7656	5	7	54,600	182	1,068,605
		2	24,992.2092	4	4	78,416	71	1,297,053
		3	55,614.6024	4	5	216,675	42	1,469,544
		4	193,073.202	4	2	190,850	18	1,670,579
		5	248,136.31..	1	0	0	1	248,136
	Other Multi-Family	1	18,158.16	5	4	22,453	98	783,395
		2	42,673.85	4	4	113,467	34	994,987
		3	71,558.44	4	5	309,670	20	1,159,615
		4	211,257.54	4	3	389,580	9	1,162,798
		5	219,965	1	1	219,965	1	219,965
Grand Total					98	9,221,576	882	27,243,062

Custom Industrial: Summary of participant data collected

Table C-3 summarizes the FR-based attribution data collection efforts for the Enbridge Custom Industrial program. The table shows the portion of the program that:

- Completed an in-depth interview
- Did not respond to an evaluation attempt at contact
- Was not contacted by the evaluation team[25]

The data collected in Table C-3 is shown as the number of customers and measures and the cumulative ex ante natural gas savings. The full sample design and achievement by strata can be found in Table C-4.

The evaluation collected FR-based attribution data for 61% of savings in the programs with a customer response rate of 45%.

[25] Sites, projects, or units of analysis where contact was not attempted were either not selected for contact in sampling or in the backup sample and were not contacted due to strata quotas being met.

Table D-3. Summary of FR data collection for Custom Industrial program

Data collection category	Targeted # measures	Completed # customers	Completed # measures	Completed Population m^3
Completed in-depth interview	100	77	107	38,859,951
Attempted contact, not completed		44	74	17,178,980
Not attempted		95	172	7,488,025
Total		166	353	63,526,956

Table D-4. FR sample achievement for Custom Industrial program

Segment	Measure Group	Stratum	Max M3	Target	Completed Measures	Completed M3	Population Measures	Total M3
Agricultural	Heating or Water System	1	121,447	4	7	117,782	44	1,438,085
		2	258,265	4	3	457,912	10	1,847,716
		3	575,790	3	3	1,210,530	4	1,786,320
		4	1,418,983	3	3	3,304,009	3	3,304,009
	HVAC	1	47,938	5	9	169,080	56	1,195,275
		2	91,768	5	3	191,952	21	1,430,340
		3	174,515	5	4	544,065	13	1,719,757
		4	232,401	5	1	193,486	9	1,829,515
		5	293,892	5	3	827,692	7	1,818,401
		6	387,263	5	2	623,850	5	1,713,855
		7	1,531,527.79	10	8	7,174,007	10	9,265,488
	Process	1	235,567	2	1	36,851	4	409,183
		2	1,171,415	4	2	970,175	4	2,996,151
Industrial	HVAC	1	96,745	3	6	391,579	17	858,041
		2	222,346	3	3	554,017	6	1,159,581
		3	285,520	2	1	242,988	4	1,024,797
		4	385,807	2	1	326,782	3	1,063,299
		5	1,232,834	6	6	5,225,893	6	5,225,893
	Process	1	112,419	4	5	270,898	23	1,151,648
		2	266,738	3	5	965,907	8	1,600,346
		3	339,809	3	3	955,636	6	1,846,434
		4	501,761	3	2	811,903	4	1,722,333
		5	531,910	3	1	517,505	3	1,576,890
		6	744,558	4	4	2,667,172	4	2,667,172
	Steam or Hot Water System	1	115,266	4	5	242,294	36	984,439
		2	268,018	3	4	818,972	7	1,400,936
		3	577,681	3	3	1,447,213	3	1,447,213
		4	3,088,477	4	4	6,344,544	4	6,344,544
	Steam Traps	1	353,964	3	4	871,249	28	2,315,286
		2	384,008	1	1	384,008	1	384,008
Grand Total					107	38,859,951	353	63,526,956

Large Volume: Summary of participant data collected

Table D-5 summarizes the FR data collection efforts for the Large Volume program. The table shows the portion of the program that:

- Completed an in-depth interview
- Did not respond to an evaluation attempt at contact

- Was not contacted by the evaluation team[26]

The data collected in Table D-5 is shown as the number of customers and measures and the cumulative ex ante natural gas savings. The full sample design and achievement by strata can be found in Table D-6.

The evaluation collected FR data for 97% of savings in the program with a customer response rate of 74%. Both values are higher than the other two programs in this study, in part because DNV attempted to collect data with a census of participants.

Table D-5. Summary of FR data collection for Large Volume

Data collection category	Targeted # measures	Completed # customers	Completed # measures	Completed Ex ante CCM
Completed in-depth interview	20	14	20	78,092,558
Attempted contact, not completed		3	4	1,545,056
Not attempted		5	7	912,112
Total		18	31	80,549,726

Table D-6. FR sample achievement for Large Volume

Segment	Measure Group	Stratum	Max M3	Target	Completed Measures	Completed M3	Population Measures	Total M3
Large Volume	Large Volume	1	1,299,829	4	4	2,619,150	15	5,076,318
		2	1,931,534	3	3	5,281,818	3	5,281,818
		3	2,439,496	3	3	6,588,836	3	6,588,836
		4	2,554,834	3	3	7,637,901	3	7,637,901
		5	2,956,973	2	2	5,696,944	2	5,696,944
		6	15,193,375	5	5	50,267,909	5	50,267,909
Grand Total					20	78,092,558	31	80,549,726

[26] Sites, projects, or units of analysis where contact was not attempted were either not selected for contact in sampling or in the backup sample and were not contacted due to strata quotas being met.

APPENDIX E. SPILLOVER SAMPLE DISPOSITION

The study team developed a multi-modal approach to conduct the survey. The sample frame included contacts with one site, as well as contacts with two or more sites. The intent of the multi-modal approach was to cost-effectively meet the challenge of programming the survey for multi-site contacts, all while minimizing the burden on customers willing to participate in this effort. To encourage participation, respondents were offered a $100 incentive for completing the survey. For the two types of contacts, different data collection strategies were utilized:

- **Single sites:** a web survey was sent via email, followed by phone outreach to non-respondents. A survey invitation was emailed to 249 recipients beginning on September 9, 2024, and a reminder email was sent on September 23, 2024, to any non-respondents. Outbound dialing began on September 16, 2024, to any non-respondents for up to five phone attempts.
- **Multi-sites**: For contacts with multiple sites, a team of experienced interviewers attempted up to five phone calls to all 353 contacts. Interviewers conducted the survey for one site and would ask if/how their answers would vary for their other sites. A survey was submitted for each site based on the responses given during these phone calls.

Survey disposition

Of the 423 sites in the eligible sample, 254 emails were sent to all single site contacts and 423 phone calls were made to all contacts. Of those attempts, 14 of emails bounced, and 44 of phone numbers were unreachable. Further, 43 of the contacts refused. All of these factors resulted in an overall response rate of 26%. A further two sites were removed from the sample during data cleaning due to incomplete information.

Table E-1. Disposition table for survey

Disposition	Email	Phone
Total sites	249	423
Unreachable		44
Refuse		43
No response	13	131
Bounced	65	0
Contacted (bounced/refused/no response removed)	184	352
Complete	42	90
Partial complete	18	0
Surveys reported	42	90
Response rate (complete/contacted)	22.83%	25.57%
OVERALL RESPONSE RATE	**25.78%**	

DNV post-stratified the sample by 2023 program participation status and size based on 2023 m^3 consumption. Stratification by participant status was done to reduce potential bias from having higher response rates from participants than non-participants, while stratification by consumption improves the representativeness of the expanded sample. Weights were calculated as the number of sample frame sites divided by the number of completed sample sites by strata. Table B-2 shows the stratification.

Table E-2. Stratification of sample

2023 program participation status	Stratum	Completed sites	Completed m^3 consumption	Sample frame sites	Sample frame m^3 consumption
Non-Participant	1	95	54,354,140	281	156,960,782
Non-Participant	2	13	44,113,081	63	213,007,190
Non-Participant	3	9	100,215,388	25	272,581,801
Participant	1	16	20,505,795	36	55,201,315
Participant	2	4	20,813,470	12	63,009,691
Participant	3	6	69,985,064	8	86,657,529

APPENDIX F. FREE-RIDERSHIP SURVEY RESPONSES

This section presents self-reported responses from the timing, efficiency, and quantity FR question battery where customers were asked “Why do you say that?”

A “yes” in the timing, efficiency, or quantity column indicates partial or full FR-based attribution for that source based on the scored questions (not the responses here). A “no” indicates no FR-based attribution for that source. For example, in the first table, a “yes” in the timing column indicates that the respondent answered the question DAT1a and DAT1b with responses that credited the program with influencing the acceleration of the project. A “no” in the timing column indicates that the respondent did not credit the program with influencing the acceleration of the project. A “no” for timing does not preclude the same respondent indicating the program affected the efficiency or quantity/size of the same project.

Additionally, following the specific timing, efficiency and quantity questions, customers were asked to summarize the program’s effect on the timing, efficiency and amount of the project installed (Dat4). These responses are presented with the scored level of FR-based attribution: full, partial, or none.

None of the responses provided below were used in the direct scoring of surveys. For respondent confidentiality, these responses are isolated from other responses from the interview and do not reflect the full story the respondent conveyed. The responses are provided here to provide insight into how customers describe their decision making on the project relative to the program. Responses are sometimes recorded in the voice of the participant and in other cases in the third person depending on the notation approach of individual interviewers. See the scope of work (APPENDIX K) for details on how FR-based attribution was scored.

Custom Commercial program

Table D-1. Timing verbatim responses for Custom Commercial program

Timing	Dat1a_O. Why do you say that?
Yes	Because the incentive was ending, there was a time limit.
Yes	EGI incentive availability and our capital fund allotment influenced timing
Yes	Experience with <vendor> influenced our participation in the project. We saw that it would work with one of our projects.
Yes	Funding was key to make this project happen. I couldn't tell you when we would have done the project, it was not a major priority.
Yes	Funding was key.
Yes	Incentive helped move the project forward. Otherwise, we would have done it in a few years.
Yes	Incentive played an important role in presenting a stronger case but they needed to be replaced.
Yes	Incentive was the motivating factor, but would have waited a little longer.
Yes	It probably wouldn't have been installed due to high costs.
Yes	Maybe we would have installed it in 2 to 5 years, maybe even never.
Yes	Since it wasn't one of our larger buildings, we would have delayed investing in a replacement for this one.
Yes	Steam trap audit is very expensive, it would be very unlikely the project would have happened without the funding from Enbridge.
Yes	The VFDs were installed only because incentives were available; Without the incentives we would have replaced only the HVAC units
Yes	The boiler controls were installed only because incentives were available; Without the incentives we would have replaced only the HVAC units.
Yes	The boilers were still working but they were at the end of their life, so we would have had to make the change eventually.

Timing	Dat1a_O. Why do you say that?
Yes	The cost of the project made it hard to get approval from the board. We only did this because we had support from Enbridge.
Yes	The decision would have taken longer because we would have prioritized other business needs
Yes	The financial incentive wasn't there without Enbridge and we may have needed additional time to accumulate funds.
Yes	The hospital marches to its own clock and timeline.
Yes	The incentive helped gain approval to move forward quicker with the project
Yes	The incentive helped move the project high in the priority list
Yes	The incentive helped with approval, most needed to get replaced and had no remaining life.
Yes	The incentives helped us expedite the decision but we were going to make the change anyways.
Yes	The project would have been a standstill without Enbridge's support
Yes	They plan replacement well ahead of failure of course at times things fail when not expected but we would have waited for the planned replacement period.
Yes	They were still working but they were at the end of their life. Without the assistance, we would have installed a year later.
Yes	This depends on how long the boiler would have lasted.
Yes	This wasn’t a priority because it didn't pose immediate health risks. If we hadn't received funds, this would have been delayed a few years.
Yes	We don't think the issue would have been flagged without Enbridge.
Yes	We might have delayed the project without an efficient unit
Yes	We might have used it until it was older but still working
Yes	We were eligible for funding at the time.
Yes	We would have had to request more capital for funding
Yes	We would have used the equipment until efficiency levels dropped.
Yes	We wouldn't have been able to implement the project due to the cost.
Yes	We wouldn't have installed the system due to the high cost.
Yes	Without Enbridge, we would have not installed the controls or BAS. We do not have the reserve funds to complete project like these and the incentive allowed for install.
Yes	Without assistance from Enbridge, we would have fixed what was broken but with the assistance we were able to continue to go down the path to be more energy efficient.
Yes	Without the financial incentive, the ROI wasn't high enough to implement the project now. We would have delayed it for a 2 years or more.
Yes	Without the incentive it would not have been possible but maybe we would have installed it 2 to 5 years out.
Yes	Without the incentive, we would have installed a similar boiler in size/capacity about 5-6 months later
Yes	Without the rebate, the project didn't have a ROI that justified the investment.
Yes	Such a large project, I don't know when we would have been able to get it done.
No	Because of the age of the boilers.
No	Due to time sensitivity, this needed to be done.
No	Enbridge did not have an impact on our decision.
No	Enbridge helped influence if this project would be installed and when primarily due to the cost.
No	Financial assistance made the CFO happy (Some financial relief available in getting the work done that was needed anyway) but it didn’t have a major effect on our decisions.
No	Following deferred maintenance program.
No	It did not effect the timing, we had to installed a new boiler due to the old one failing.
No	It didn't have an effect on timing, eff, or amount. Our boilers were failing and needed to be replaced.

Timing	Dat1a_O. Why do you say that?
No	It was needed. It had slightly higher priority than the other project.
No	No impact of Enbridge on our decision
No	No impact of Enbridge on our decision.
No	Our board of directors were happy about the incentive but would have done this project without an incentive at the same time.
No	Our financial cycle dictates timeline.
No	Part of deferred maintenance.
No	Regardless of Enbridge's involvement we would have done the project.
No	Same time or later; Timing was determined mainly because of the performance of equipment and high gas bills.
No	System failed at the time, the first boiler failed around 2021 and the second failed towards the end of 2022. We would have found the replacement parts to keep the old boiler but they weren't available.
No	The Enbridge assistance did not affect timing, quantity, or efficiency of the heat recovery project.
No	The boiler was getting to the end of its lifespan, and it needed to be replaced asap. Enbridge's incentive had no impact on the timeline of the replacement.
No	The boilers had to be replaced regardless of the incentives. People from <vendor> had worked with Enbridge before so things went very smoothly.
No	The equipment was old and had to be replaced - at end of useful life.
No	The equipment was old and had to be replaced asap.
No	The financial incentive didn't impact our decision, we wanted to bring the system under one vendor.
No	The project would have been completed at the same time.
No	The type of insulation and repair schedule demanded a similar timeline regardless of assistance.
No	They needed to be replaced.
No	We had to complete all measures at the same time
No	We had to wait for the approval but overall the timing was as it was expected to be.
No	We have a tried and tested approach and a 5-year plan that we do our best to stick to. Enbridge's incentives would not have affected that. The incentive is seen predominantly as a nice to have bonus.
No	We needed heat
No	We typically fix steam traps when there are failures at the time. However, the studies allowed for us to identify potential failures before they occur,
No	We would have completed at the same time
No	We would have completed project at same time more or less because it wasn't costly for us
No	Without the assistance it would have been likely that we installed the same highly efficient boiler at the same time.
No	Without the assistance we may have installed a similar set of 2 condensing boilers around the same time.
No	Without the assistance, the project would have moved forward as is.
No	it made sense to do all of the measures at the same time. Failing equipment. Needed to provide more cooling per regulations/requirements.

Table D-2. Efficiency verbatim responses for Custom Commercial program

Efficiency	Dat2a_O. Why do you say that?
Yes	Enbridge did not have impact on the capacity of the boiler. The decision was always to go with high efficiency boiler due to long term cost saving calculations.
Yes	Enbridge helped reprogram the existing system, we would have continued to run the system the same way without modifications.
Yes	Expertise from Enbridge's rep was incredible.
Yes	Financial incentives help with selecting condensing boilers vs non condensing boilers.

Efficiency	Dat2a_O. Why do you say that?
Yes	Focus was on replacement for a new version rather than high efficiency, but it is a higher efficiency than the previous boiler.
Yes	From a financial perspective maybe yes a higher efficiency equipment; Better ROI
Yes	Incentives made decision to invest more into BAS with large number of sensors it can get complicated and expensive.
Yes	Incentives play a significant role to decide which projects move forward and timing, energy efficiency has improved at location of installs
Yes	It was sent with a new system tried and tested in the UK.
Yes	Might have gone with a system with less features if we didn't have the incentive.
Yes	Needed incentives to make the installation.
Yes	The funding made it a higher priority, although we would have installed the same quality.
Yes	We don't know if we would have done the project without Enbridge's assistance. Probably, a lower quality controls.
Yes	We probably would have kept the current system because it would be too expensive to upgrade without the program.
Yes	We typically wouldn't have gone with a recovery unit for better efficiency in the shoulder season. Specifically we wouldn't have installed the bypass on heat recovery with free cooling.
Yes	We would have gone for a less efficient but more affordable project.
Yes	We would have installed a similar system at the same time.
Yes	We wouldn't have done it without incentives.
Yes	We wouldn't have installed controls.
Yes	We wouldn't have installed it, and would have waited for equipment replacement.
Yes	Without incentive, we would have gone with a lower efficiency boiler.
Yes	Without the financial incentive, we would have gone for a lower quality monitoring.
Yes	Without the financial incentive, we would have kept the existing system in place. Primarily, because of costs.
No	<Vendor> brought the same solution, so we would have installed it anyways.
No	Enbridge didn't have an impact on our decision.
No	Enbridge didn't have an impact on our decision. The equipment was at the end of its useful life.
No	Experience at another project gave confidence to install this similar system.
No	Focus was on replacement for a new version rather than high efficiency, but it is a higher efficiency than the previous boiler.
No	If there was a large price difference in code vs high efficiency perhaps we would have gone with the code option, but our company is focused on lowering our carbon footprint so it’s not likely.
No	If we were going to invest our money, we would look at only high efficiency equipment.
No	Incentive doesn't impact this project.
No	It was the only option we had in the market.
No	It was the only option, there was nothing more efficient.
No	Long term cost of running it are important to us.
No	Our company goals require us to meet certain efficiency.
No	Reduce our usage and got expectations from the engineering team; Designed a system that was as efficient as possible.
No	The Enbridge assistance did not affect timing, quantity, or efficiency of the heat recovery project.
No	The consultant said it’s a good system, we didn’t hear about different quality or efficiency levels with the BAS option.
No	The incentives moved us to look for more energy efficient options and best of class.
No	The rebates are nice but we had to spec out the projects to meet our needs first, ROI, etc.

Efficiency	Dat2a_O. Why do you say that?
No	The technology doesn't scale down in cost with less size or efficiency, would have been same equipment regardless.
No	We are already installing at the highest efficiency we can get with out budget from the Ministry, without revamping the entire infrastructure.
No	We are following a regular maintenance program.
No	We cared more about having the right specs for the projects but the rebates are nice.
No	We did our own research because we wanted 95% efficiency
No	We followed the code requirements for insulation jackets on steam traps.
No	We had a company goal of carbon emission reduction. <Vendor> brought the same solution, so we would have installed it anyways.
No	We have a mechanical engineer who manages sizing to the building but does consult on sizing with the boiler manufacturer.
No	We have standards for high efficiency equipment.
No	We have to follow the preferred vendor list. It would need a similar or better gas reduction.
No	We knew what we wanted.
No	We look for energy efficiency, and then it is just deciding local vendor preferences.
No	We look for energy efficient equipment.
No	We made the decision based on our own internal research and vendor's recommendation.
No	We mirrored the system in the UK that was successful.
No	We only needed a repair so we would have done the same.
No	We repaired the steam traps that needed to be repaired.
No	We selected the boiler ahead of time.
No	We want to lower our emissions and get more energy efficiency. Without the assistance, we would have installed a similar boiler with the same capacity.
No	We wanted to lower carbon footprint with electric. Given what we did, it was not really an efficiency thing because we now have it on electric and the vendor only had one option.
No	We wanted very high efficiency.
No	We went with the most efficient option based on room size.
No	We went with the vendor recommendation.
No	We were disappointed by the low rebate.
No	We would have considered a roof of lower value.
No	We would have found the best we could get at the time, matching the first boiler.
No	We would have gone with the same efficiency.
No	We would have gone with the vendor recommendation.
No	We would have installed a similar system because we wanted the highest efficient system boiler.
No	We would have installed higher efficiency boiler if we had received more incentives.
No	We would have looked for the most efficient boilers.
No	We would have picked what our consultant suggested, no matter the incentives.
No	We would have waited more time but we would have installed a similar high-efficient system.
No	We wouldn't have installed anything less efficient. Enbridge keeps me up to date with where the market and incentives are going.
No	We've had a positive experience with Enbridge with garage conservation and energy decoupling.

Table D-3. Quantity verbatim responses for Custom Commercial program

Quantity	Dat3a_O. Why do you say that?
Yes	A steam trap audit is very expensive, it would be very unlikely the project would have happened without the funding from Enbridge. We would have either not installed any, or it would have been a lot fewer steam traps.
Yes	Incentive allowed for more area, originally looking at covering only <sqft>
Yes	We fix steam traps when there are failures at the time but we have started to predict potential failures, saving maintenance during each summer outage when we replace the traps.
Yes	We only installed the VFDs because of the incentive.
Yes	We would have done what we could afford. It's hard to say without knowing our numbers.
Yes	We would have maintained the vintage equipment and not installed the new system at all.
Yes	We would have prioritized 4-5 instead of 10-11, and we would have pushed the remaining steam traps for later in the summer.
Yes	We wouldn't have installed the electric generators.
Yes	Without the program we would have installed half. We installed 11 and without funds it would have been 5 or 6.
Yes	Without Enbridge assistance and funding, we would simply not have done it at all.
Yes	Without Enbridge, we would have had to band-aid the system so that it's functional.
Yes	Without Enbridge, we would have not installed the controls or BAS.
Yes	Without the funding for this survey, we would not know which to replace, so we would not have replaced any.
Yes	Without the program we would have replaced only one boiler instead of two.
No	All the heat pumps that needed to be replaced were replaced.
No	All the steam traps that were identified were replaced.
No	All the steam traps were insulated.
No	Enbridge did not have impact on the capacity of the boiler.
No	I think all the heat pumps that needed to be replaced were replaced.
No	It would have been sized to meet our buildings demand regardless of the incentive.
No	It's a big building so we would have gone with the same capacity.
No	It's part of a deferred maintenance program.
No	Our boilers were failing and needed to be replaced. The incentive didn't impact our decision.
No	Quantity and size installed were a result of past experience with similar measures. If we had more funds, we could invest in other sources of energy like geothermal.
No	Regardless of Enbridge's involvement we would have done the project the same way.
No	The AHU install was required for the boiler install.
No	The building had only one existing boiler and needed only one.
No	The equipment was at the end of useful life, there was no impact of Enbridge on the decision.
No	The equipment was at the end of useful life. There was no impact of Enbridge on the decision. We replaced the number needed.
No	The key benefit of financial assistance was helping us select condensing boilers vs non condensing boilers.
No	The old system had a larger capacity than necessary so we were able to lower the capacity for the new system but we would have right sized similarly without the assistance.
No	The only option was to replace the traps that were close to failure.
No	The pre-existing boiler failed and we had to replace it right away. The program didn't effect the size or quantity but it did allows us to get a higher efficiency boiler (condensing).
No	The program incentive pushed us to make the replacement change but it didn't affect the quantity or efficiency. The size is what we needed.
No	The project was about modifying our existing system and optimizing it to work better. There were not really any additions so the quantity doesn't change.

Quantity	Dat3a_O. Why do you say that?
No	The quantity is the same as it was prior. It's part of regular maintenance.
No	There are only two boilers at the facility.
No	There are only two boilers at the facility. We replaced both at same time to avoid extra costs later on.
No	There are three boilers in school, the third one was a condensing boiler that was replaced in 2013/2014.
No	There is only 1. No more was needed.
No	Two were replaced. We had one condensing boiler already. Only two ever run at the same time with a third as back up.
No	We did only what was needed.
No	We did the majority of our steam traps based on <vendor> recommendation.
No	We don't know we just took <vendor> and Enbridge's word for it that 2 would have been sufficient and our engineers approved.
No	We had to have this capacity in order to heat the building.
No	We have a mechanical engineer who manages sizing to the building but does consult on sizing with the boiler manufacturer.
No	We have annual steam trap surveys conducted at the site. I choose which ones I want to replace based on if they're in important locations or if they have high savings potential. I would do everything the same regardless of the incentive - same number, same locations, same time, same traps.
No	We installed a similarly sized capacity for the boiler relative to the old system.
No	We installed the capacity needed.
No	We installed the required number of thermostats needed.
No	We just needed the quantity we went with.
No	We need 2 boilers to meet our heating needs.
No	We need 2 boilers to meet our needs.
No	We need a back up for the building where the 2 boilers were installed.
No	We needed the amount we installed.
No	We needed the number we installed.
No	We only have one.
No	We only needed one and this was the only option on the market.
No	We only needed one boiler for our space.
No	We replaced all the boilers in the building.
No	We went with what <vendor> recommended.
No	We would have completed the project exactly the same with or without the incentive.
No	Without the incentive we would have purchased an estimated 50% fewer traps.

Table D-4. Dat4 verbatim responses for Custom Commercial program

Attribution	Dat4. Summarize the program's effect on the timing, efficiency, and amount that you installed.
Full	<company_name> save gas and electricity and with the assistance provided by Enbridge we can see greater ROI. This will help savings that can be transferred to customers. We are pleased with Enbridge's timing, and amount, as well as the efficiency of the equipment.
Full	Discovery of right projects with Green team along with funding helped avoid delaying the project.
Full	Efficiency drives replacement, not recommendations to make a change that come from Enbridge
Full	Enbridge helped influence if this project would be installed and when, primarily due to the cost. We may have done this project later without the cost, about 50/50 likelihood. There is no real influence on the efficiency or quantity because the system would be the same as it was an optimization of an existing system. Enbridge paid for our time (labor) spent optimizing their system.
Full	Enbridge worked direct with <name>.
Full	Experience at other project gave us confidence to install this similar system, which we would have done at the same time. Initial incentives helped. Boilers are ease of maintenance for our staff but AHU was influenced by incentive. Incentive plays a big part in moving project forward.
Full	Funding positively impacted timing.
Full	Incentive played an important role in presenting a stronger case but we needed to replace it.
Full	It did not affect the timing, we had to install a new boiler due to the old one failing. We probably would have gone with a lower efficiency without the incentive. Same amount with or without program.
Full	Rebate influenced our decision.
Full	Steam trap audit is very expensive, it would be very unlikely the project would have happened without the funding from Enbridge. Without funding we would have either not installed any, or it would have been much less steam traps, at a later time.
Full	The incentive helped us to do the project earlier than we would have without the incentive. We would have gone with the same quantity and likely the same efficiency.
Full	The likelihood of doing this project would be only 1% without Enbridge. Management is unlikely to want to spend the money on a project like this and the only reason it could get done is by the Enbridge's assistance and funding. Without assistance, we would have not install the project, so this does not affect the efficiency and quantity, they would simply not do it.
Full	This project was part of a larger company plan to go high efficiency. Generally speaking our company looks for opportunities where the budget allows to replace existing equipment with high efficiency equipment to reduce cost and increase return.
Full	This would not have been possible without Enbridge. If we had to do it on our own, it would have taken longer and possibly not with the same effectiveness or quantity without Enbridge.
Full	We identified the traps that needed replacement under an Enbridge funded survey. Without the funding for this survey, we would not know which to replace, so therefore we would not replace any.
Full	We installed the VFDs and boiler controls only because incentives were available. Without the incentives, we would have replaced only the HVAC units.
Full	We were doing a renovation of the labs, the vendor made us aware of this technology and we asked Enbridge if they would provide funding. We would most likely not have installed this project without funding due to the high cost. We would have maintained the existing vintage equipment.
Full	We were somewhat likely to install the boilers and would have installed them maybe 2-5 years later but we would have installed similarly high efficient boilers and would have needed to install 8. The incentive helped to keep the project moving forward.
Full	We would have implemented a similar system but 2 years later.
Full	We would have installed a less efficient AHU 2 years later.
Full	Without Enbridge, we would have not installed the controls or BAS. We do not have the reserve funds to complete project like these and the incentive allowed for install.
Full	Without the assistance, it would not have been likely that we would have installed these generators at all.
Full	incentive played an important role in presenting a stronger case but they needed to be replaced.
None	Didn't work too closely with Enbridge, other than applying for rebate. It was factored in through the contractor we chose.
None	Enbridge didn't have any effect on timing, efficiency, or quantity. Our board of director were happy about the incentive but would have done this project without an incentive at the same time, efficiency, and quantity.

Attribution	Dat4. Summarize the program's effect on the timing, efficiency, and amount that you installed.
None	Enbridge didn't have effect on the amount and efficiency of the boilers installed but they did have effect on the timing. It helped us put a push on things and finalize decisions as we wanted to get the incentives before they ran out. We would have still installed but Enbridge pushed us to consider asap.
None	Enbridge has little or no influence on this project.
None	Enbridge or incentives had no impact on decisions or timeline. Everything was already decided before the vendor reached out to Enbridge.
None	Financial assistance made the CFO happy. Some financial relief available in getting the work done that was needed anyway but it didn't have a major effect on their decisions.
None	It didn't have an effect on timing, efficiency, or amount. Our boilers were failing and needed to be replaced.
None	It would have been 80% likely that we would have installed the same boiler at the same time.
None	No, because of the deferred maintenance program
None	None decision part of regular maintenance replacement
None	System failed at the time, the first boiler failed around 2021 and the second failed towards the end of 2022. We would have found the replacement parts to keep the old boiler but they weren't available. So we found a similar system that was available but we try to get equipment that meets the program specs to get funding including a higher level of efficiency.
None	The baseline boiler was installed in 1968 and needed to be replaced. The program was helpful but didn't influence the timing/quantity/efficiency.
None	The boilers we got are good - though we would have preferred more efficient boilers - 100%. Then the installation of the boilers took a year and some issues are still outstanding so we are not operating at full 85% efficiency and maybe that's why the rebates are so low. The installation has been so slow that the warranty was extended beyond 1 year. In hindsight we should have gone directly to the manufacturer – <cpmpany_name> didn't keep to their word regarding the turnkey solution. Also, the training was zero. We had to get an electrician from the parish to tell us more about the boiler.
None	The equipment was at end of useful life. No impact of Enbridge on our decision.
None	The incentive amount only affected our decision in choosing the vendor, Project Manager at <company_name> worked with Enbridge. Customer had no interaction with Enbridge.
None	The incentive amount only affected our decision in choosing the vendor, Project Manager at <company_name> worked with the Enbridge. Customer had no interaction with Enbridge. They are the only ones that proposed it
None	The project would have been completed at the same time, same efficiency and amount.
None	There was no impact on timing, efficiency and amount because the project would have been completed the same way without Enbridge's assistance. Our interaction with Enbridge was limited to paperwork as <company_name> handled the majority of the engagement with Enbridge.
None	This is an <facility_type> facility with people on various <medications>, regulations state specific temperature ranges for the rooms and the old system was failing and not reaching required temps. The program didn't affect the timing, efficiency, quantity of equipment installed, but we appreciate the rebate.
None	We appreciate the incentive, but it does not influence which steam traps we replace and when we replace them.
None	We like the advanced feature of this product. We installed what was needed to be installed.
None	We would have been about 50/50 and we appreciate Enbridge's help with installing this. Without the assistance we may have installed a similar set of 2 condensing boilers around the same time.
None	We would have moved forward with the projects with and without Enbridge. Heat pump are really a go-to for all the clients now
None	We would have moved forward with the projects with and without Enbridge. Heat pump are really a go-to for all the clients now.
None	Without the assistance it would have been likely that we installed the same highly efficient boiler at the same time.
None	Without the assistance, the project would have moved forward as is.
None	Without the assistance, we would have installed a similar number at the same time on <company_name>'s recommendation.
Partial	As noted before, with 15 years of experience, Enbridge does not drive the replacement. We usually reached out to them knowing what we are going to install to get the incentive paperwork sent to us.
Partial	Enbridge does not drive our timing. We contact Enbridge as we plan replacements to get assistance forms.

Attribution	Dat4. Summarize the program's effect on the timing, efficiency, and amount that you installed.
Partial	Enbridge had a 40% influence on decisions.
Partial	Our ESA is very helpful and cooperating. Working on a 3 year cycle on stream trap evaluation. We only have about 60 man hours to identify what needs replacement so the studies help prioritize. We typically fix steam traps when there are failures at the time. However, the studies allowed for us to identify potential failures before they occur, saving maintenance during each summer outage when we replace the traps.
Partial	The incentive allowed the timeline to be accelerated and allowed us to cover more sq footage of the roof but we would have gone with the same R value.
Partial	The incentive helped us gain approval to move forward quicker with the project. Employees were often changing the heating temp and gas bills were high. The thermostat is controlled by only a few people via phone app. It's been working out well. We will do a savings calc after this winter to compared pre and post winters.
Partial	The incentive program influenced the number the boilers replaced and maybe could have an influence on the timeline.
Partial	The incentive was very helpful. It would have been a painful purchase without the incentive. The reps were very helpful.
Partial	The timing would have been delayed by a few months (3), we would have gone with the same steam traps (efficiency), and 50% fewer traps without incentive.
Partial	The incentives moved us to look for more energy efficient options and best of class. Makes the choice easier. It was very important the incentives go direct to the team
Partial	We had an old Siemens system in place but wanted to install a new Trane system to bring everything under one vendor. Without the assistance, we would have installed a similar system at the same time. We thought about the installation as one whole building automation system that controlled heating, cooling, lights etc..
Partial	We have been a big fan of incentive programs because they help us do these projects that are safer for our people and environment.
Partial	We wouldn't have done it at the same time.
Partial	Without the assistance, we would have been likely to replace the traps. We may have done it a few months later and we would have prioritized replacing <number>-<number> traps out of the <number> but we would have eventually replaced all <number>. Incentive helped convince management. <company_name> and Enbridge might have had conversations that would have influenced us.
Partial	Without the assistance, we would have installed a similar boiler with the same capacity a year later.
Partial	Without the incentive, we would have installed a similar boiler in size/capacity about 5-6 months later.

Custom Industrial program

Table D-5. Timing verbatim responses for Custom Industrial program

Timing	Dat1a_O. Why do you say that?
Yes	<institution> marches to its own clock and timeline.
Yes	Because of capital access, last year was a good year but this year things are tight.
Yes	Cost is very high for the survey, without the incentive, we would not do the replacements.
Yes	Costly project, it probably wouldn't have been approved without rebate.
Yes	Due to high costs, other projects would have gotten the priority.
Yes	Due to the high cost, other projects would have been prioritized if it wasn't for the incentive provided.
Yes	Enbridge's incentive helped because we would not have been able to implement the boiler controls and the type of boiler at the same time/ quality.
Yes	Financing availability and cash flow of business allows us to install measures. we had more cash flow in the years after covid but business is returning to a more typical cycle now
Yes	I only chose because of incentive
Yes	If we hadn't received funding, it probably never would have happened due to cost.
Yes	Incentive was key

Timing	Dat1a_O. Why do you say that?
Yes	It was needed but I would have had to look for other sources. I had to pitch it to ownership and it wouldn't have been accepted without paybacks. The incentive money helped ownership move forward.
Yes	It was such a large project, don't know when we would have been able to get it done without assistance.
Yes	It would not have been built without the financial and technical assistance of the program.
Yes	It's hard to say what the board would say. Oil tank would last a long time
Yes	Lack of resources would have made it later if at all.
Yes	Likely never, ROI is required to be within a short timeframe. ROI didn't make sense without Enbridge's incentive.
Yes	Major capital concerns with aging equipment at the facility so stretched thin. It was on the radar but would have been delayed.
Yes	Needed to happen. Hard to know how much later
Yes	Rebate and signoff from Enbridge on project helps significantly.
Yes	Same time or maybe a year later
Yes	Thanks to Enbridge's incentive, we were able to move the project forward one year.
Yes	The ROI with the incentive made the project a priority. Without it, the project might have been delayed.
Yes	The budgeting cycle has a two year lag, so we wouldn't have made the investment now.
Yes	The cost of insulation is high
Yes	The equipment would have started to decline after 24 months, so that was our timeline to make the change without Enbridge
Yes	The financial assistance backed up the business case to make the project now instead of 2-5 years later.
Yes	The funding stimulus was there and it was worth taking advantage of to make the energy improvement
Yes	The incentive allowed us to hit the ROI within the corporate standard.
Yes	The incentive was essential to the timing and type/ efficiency of the measure installed.
Yes	The project would have been forgotten without Enbridge's collaboration in lieu of other action items. At best it would have been delayed.
Yes	They would have somewhat likely have done the project eventually. Not sure how long they would have waited.
Yes	This project wouldn't have been prioritized without the incentive.
Yes	This wasn't a priority for us. I can't tell you when/if we would have done it without Enbridge.
Yes	We did it because we were eligible for funding. The report said 30-45% failure rate on existing. So did not make sense to repair the existing steam traps. Last steam trap survey was 4 yrs old.
Yes	We didn't have the resources
Yes	We had to take action before winter.
Yes	We lacked the resources.
Yes	We might not have learned about it without the advisors.
Yes	We never would have done it because we needed the boiler to run all the time.
Yes	We only did this because we had support from Enbridge
Yes	We only did this because we had support from Enbridge.
Yes	We would have delayed the project for a year or more because senior management weren't convinced.
Yes	We would have monitored our consumption over time to confirm if it would have been worth it to install the curtains.
Yes	We would have needed additional time to get the funds to finance the project.
Yes	We would have replaced the existing controls.
Yes	We would have taken longer due to high cost
Yes	We would have waited a year to see what the program offering's looked like at that time.

Timing	Dat1a_O. Why do you say that?
Yes	We would have waited longer without the incentive because of costs
Yes	We would have waited on this particular building because it's not one of the larger buildings, less savings, etc.
Yes	We wouldn't have done the replacement on both tanks at the same time if we hadn't had the financial incentive.
Yes	We wouldn't have replaced it without assistance
Yes	With the calculations provided by Enbridge we were able to see the savings for this measures as well as the cost incentives. This helped move the project forward.
Yes	Without Enbridge modeling help it would have taken me more time on my own to run my own model.
Yes	Without Enbridge, we would have installed vent seals in phases, gradually over a longer period of time
Yes	Without Enbridge, we would have monitored our consumption over time to confirm if it was worth to install the curtains.
Yes	Without Enbridge, we would have implemented the project in less than four years but the incentive helped move things along faster.
Yes	Without the assistance, we would have been less likely to install the controls. We may have done it later and would have installed 1 or 2 instead of all 3.
Yes	Without the financial incentive we might have never made the change.
Yes	Without the funding assistance, we would not have completed the survey every year. It would have been 1 year later because we would switch to a survey every other year.
Yes	Without the incentive it would not have been possible to do it this year but maybe we would have installed it 2 to 5 years out.
Yes	we would have waiting longer without the incentive
No	Approvals were delaying the project but we had the same time frame in mind.
No	Because this type of project needs to be completed every 5 years or so. I think we still would have replaced it but with double poly.
No	Because we were boxed it, the project had to get done because we needed to run the engine because of the arrangement with our electricity supplier we needed the heat sink.
No	Enbridge's incentive helped because we would not have been able to implement the boiler controls and the type of boiler at the same time/ quality.
No	Funding might have been less and we would have reviewed the project for any possible reduction but we were trying to install everything at the same time.
No	Had to wait for the approval but the timing was as it was expected to be.
No	In need of replacement
No	Incentive had no influence on our timing. The incentive amount was very little compared to overall project cost.
No	It had to be done.
No	It was 50/50 if we were going to install it but would have installed a similar process at the same time with a similar amount of efficiency. The funding helped install it.
No	Submitted for approval in 2021, would have happened same time
No	The decision was made based on what was best for business
No	The incentive and aid from Enbridge had little/no influence on our timing because the financial incentive was s very little compared to overall project cost
No	The incentive helps us make the change faster and simultaneously, instead of spread out throughout the year. We would have done it either way.
No	The steam traps would have been replaced regardless of the incentive.
No	The upgrade was scheduled to happen anyways
No	Timing and efficiency was not impacted because it was a new building and the building needed to be opened.
No	We don't know if we would have had the capital to implement the project in the same time frame without Enbridge's help.
No	We had been considering the project for a while, energy savings were an afterthought.

Timing	Dat1a_O. Why do you say that?
No	We had planned to do the steam straps at this time, however the Enbridge audit allow us to have regular updates on which steam traps to replace next.
No	We had to do the project at that time either way.
No	We needed to install a boiler
No	We needed to install the air compressor for funding alongside the VFD install
No	We were going to do everything as we did regarding timing, efficiency and quantity but they were helpful.
No	We would have done it at the same time because we only have one major shutdown per year.
No	We would have had to install the same quantity at the same time due to the project timing
No	We would have installed curtains at the same time but would have been more at the shading criteria.
No	We would have installed two of the four air curtains at the same time, but the incentive helped us do all four.
No	Winter time is when I can install it.
No	Without the technical assistance, we may have gone to our contractor to get a recommendation on what to install. They may have recommended something similar to install at the same time but not sure.
No	would have had to install the controls regardless of the programs help
No	would have needed to install something at the same time but would have gone with double layer

Table D-6. Efficiency verbatim responses for Custom Industrial program

Efficiency	Dat2a_O. Why do you say that?
Yes	Enbridge helped select the control that I was looking for.
Yes	Enbridge's incentive helped because we would not have been able to implement the boiler controls and the type of boiler at the same time/ quality
Yes	Enbridge's incentive helped because we would not have been able to implement the boiler controls and the type of boiler at the same time/ quality.
Yes	Financial assistance was key to decision around the project
Yes	Fine tuning on the controls at the time, what we actually installed was not the standard in the industry
Yes	Incentives allowed us to afford a better model of curtains. We would have installed a cheaper one.
Yes	Investment allowed for a significant reduction in natural gas consumption. Without incentive we would have continued to consume natural gas which was contrary to the objective.
Yes	Most of our crops are low light so we would have gone with more shading than with R value.
Yes	Probably, without the investment the efficiency we calculated as part of the cost-effectiveness of the project would have decreased. Since we did a cost-effectiveness analysis putting all together, we would have made the same decision.
Yes	Savings were key to the decision, and we didn't know about the savings prior to this.
Yes	The funding allowed for a better job on the insulation than we would have picked otherwise.
Yes	The funding helped us get a thicker material than we would have afforded otherwise.
Yes	The incentive helped us get to a higher efficiency.
Yes	The incentives allowed me to acquire a higher quality controls.
Yes	The knowledge for installing it was key to success.
Yes	The knowledge provided by Enbridge, demonstrating the savings of a new boiler convinced us to invest in it. The financial assistance was key in this decision too.
Yes	The program allowed additional efficiency and convinced us to install more insulation.
Yes	The project wouldn't have moved forward without the financial and technical assistance.
Yes	The rebate outweighed the extra cost on the difference between efficiency levels.
Yes	We probably would have done the same as what we had before, insulation with lower R value.

Efficiency	Dat2a_O. Why do you say that?
Yes	We still would have replaced it but with double poly.
Yes	We were convinced to go thicker with Enbridge's recommendation.
Yes	We would have done a similar scope without the assistance.
Yes	We would have gone for a lower quality option if it wasn't for the rebate.
Yes	We would have gone for a potentially more expensive option. Enbridge helped us not overspend and get something beyond what we needed to do the job.
Yes	We would have gone with a lesser efficiency, we needed the funding to upgrade.
Yes	We would have gotten less efficient equipment, and the process would have been more manual and less efficient due to missing controls.
Yes	We would have installed a double layer roof without the incentive.
Yes	We would have installed a less efficient air compressor.
Yes	We would have installed a roof with less layers without the incentive.
Yes	We would have installed a warehouse alternative that had a longer lead time and less savings because it was less expensive.
Yes	We would have installed something of lower quality to adjust for our budget.
Yes	We would have installed something of lower quality to adjust for our budget. The assistance with installation was essential to us.
Yes	We would have kept the existing system or upgraded to something less extensive.
Yes	We would have kept the existing system.
Yes	We would have kept the existing systems.
Yes	We would have looked for similar or lower quality equipment, with less advanced controls due to costs.
Yes	We would have made an upgrade to a less efficient equipment without the program.
Yes	We would have probably gone with 1-inch thickness to budget for other priorities.
Yes	We would have replaced it with the same type of equipment, but smaller and less efficient due to cost.
Yes	We wouldn't have done this project without the program.
Yes	We wouldn't have implemented anything.
Yes	We wouldn't have installed insulation if it weren't for the incentive. If we did, we would have used a lower value one.
Yes	We wouldn't have upgraded but have repaired the equipment.
Yes	Without Enbridge's financial and technical assistance we wouldn't have implemented the project at all.
Yes	Without assistance, we would have gone for a lower quality project.
Yes	Without the financial incentive we would have gone with less advanced controls.
Yes	Without the grant, we wouldn't have replaced it for some time, and likely for a lower quality equipment.
Yes	Without the reassurance and knowledge shared by Enbridge we would have gone a cheaper route but it wouldn't have been as effective.
Yes	Without the technical and financial assistance, we would have installed a standard condenser that is significantly less efficient. In part, due to its high cost.
No	We got the funding internally to install what we scoped.
No	Because the size of the system was dependent on the amount of energy from the engines so we couldn't change this.
No	Financial assistance allowed us to improve quality.
No	From our conversation with the vendors, the equipment chosen was the only option that met our needs.
No	Hard to say, maybe not as robust as what we were expected to end up with.
No	If we had waited longer we would have secured more advanced controls but this was the best in the market for efficiency at the time of purchase.
No	If you're going to do it, you better do it right.

Efficiency	Dat2a_O. Why do you say that?
No	Insurance provider has minimum requirements for roof installations we have to meet.
No	It was the most compatible option for us.
No	Once the project was approved we were going to move forward with the properly engineered project to comply with company policies.
No	Since we expanded the farm we installed the same system.
No	The curtains were the best to retain the heat we required in the greenhouse and for the crops. The rebate was to small to drive our decision.
No	The engineering guideline required the same.
No	The equipment was the one recommended by <vendor>.
No	The financial assistance allowed us to improve the quality.
No	The high energy savings meant we would have picked the same option regardless of Enbridge's involvement.
No	The incentive allowed us to get more sophisticated equipment to monitor feed intake but we would have chosen something similar.
No	The internal engineering team made the decision.
No	The scope of the project was not influenced by the incentive or assistance. We would have it anyways.
No	This was the highest upgrade we could with <vendor> .
No	We didn't have many options.
No	We hadn't considered installing door sensors to ensure doors are closed properly throughout the facility.
No	We looked at many but needed one with control to put air back into the building.
No	We needed the correct R value to make it work but would have chosen the same insulation
No	We shouldn't have chased a higher efficiency for more dollar incentive, just needed to hit our thermal efficiency number.
No	We were looking at efficient measures to reduce our usage.
No	We would have done it the same.
No	We would have implemented a lower quality product than the one we were able to obtain thanks to the financial and technical assistance provided by Enbridge.
No	We would have installed a similar thickness to what was recommended by the contractor.
No	We would have made the upgrade but the incentives pushed us to it more.
No	We would have picked same ability but less quantity if we didn't have the incentive.

Table D-7. Quantity verbatim responses for Custom Industrial program

Quantity	Dat3a_O. Why do you say that?
Yes	At the time we would not have been able to do all 4 curtain and would have completed 2.
Yes	The incentive helped improve the footage because we are now spending less out of pocket.
Yes	The pre planning was extensive, we wouldn't have had the accurate calculations that proved and convinced us to install more insulation.
Yes	The project wouldn't have been done at all without the program.
Yes	They would have only done about 15% of the original project, significantly less insulation. 15m instead of 100m.
Yes	We spent a lot of time with Enbridge reviewing the equipment.
Yes	We would have done 1 or 2, instead of 3.
Yes	We would not have installed it without the assistance.
Yes	Without funding, we wouldn't have installed a new system until the current equipment failed.

Quantity	Dat3a_O. Why do you say that?
Yes	Without the incentive it's likely there would have been no changes until the equipment was closer to failure.
Yes	Without the incentive we would have maybe installed one or none of the oven controls.
Yes	Without the program, it would have been likely that we would have replaced the steam traps but we would have replaced about 10-20% less.
Yes	Would have installed more because of their help. Some the existing heaters still in use because of their locations, we replaced the ones that were most easy to access.
No	Continued participation allows us to better assess which steam traps to replace next. Year over year the quantity of steam trap replacements declines, due to continued participation.
No	Heat exchangers don't really have a large range of technologies available. So we would have landed on a similar solution.
No	I would have done the same system if I didn't have the incentive.
No	If we are going to do the job we would do it right and insulate the whole pipe. However the program promotes a higher R value insulation than we would have gone with if we were going to install insulation.
No	If we were going to do this project we would have done the same area/size.
No	If we're going to do it we are going to do the whole area.
No	Incentives did not affect the quantity; certain steam traps needed to be replaced.
No	It's a finite amount required.
No	It's the amount required for the area.
No	Quantity and size would have been the same but quality would have been different.
No	Quantity would not have changed whether we received assistance or not.
No	Rebate didn't impact the decision making process because it was just a small percent of the cost.
No	That was the surface area that needed to be insulated.
No	The building needed the two boilers.
No	The incentive form Enbridge had little influence on the decision making process. We had to select from a limited range of capacities/size.
No	The number of door sensors would have been the same with the assistance.
No	The number of unit heaters needed was determined by the HVAC company and had nothing to do with me or Enbridge.
No	The number of units would have been the same.
No	The number was preset by how many curtains were needed.
No	The process was binary. Either install it or not. There wasn't a different quantity or size that we could have gone with.
No	The scope and numbers of sensors would have stayed the same.
No	The square footage to be done would have been the same.
No	We always do this amount
No	We had the controls scoped out for us at the start of the project.
No	We have waste steam that needs to be captured. We had 100 steam traps and we replaced some while some are new ones.
No	We installed the same system to the newly expanded section.
No	We need at least the one to control the system.
No	We needed this quantity of units for the new greenhouse, even without the program.
No	We would have done all 12.
No	We would have done the increase in phases, over a longer period of time.
No	We would have done the same amount of pipe insulation.
No	We would have done the same thickness.

Quantity	Dat3a_O. Why do you say that?
No	We would have gone with the same quantity.
No	We would have installed the same number due to mechanical requirements.
No	We would have installed the same quantity no matter what due to the process.
No	We would have installed the same quantity and size regardless of the incentive because of the high carbon tax costs we had with the previous equipment.
No	We would have installed the same system.
No	We would have needed to cover the same amount of area.
No	We would have still had to install the one.
No	Without the support and incentives the upgrades wouldn't have been done at all anytime in the foreseeable future.

Table D-8. Dat4 verbatim responses for Custom Industrial program

Attribution	Dat4. Summarize the program's effect on the timing, efficiency, and amount that you installed.
Full	Enbridge has a very positive effect on the timing, efficiency and amount. The reps are super knowledgeable and have helped out tremendously. I grow plants and I'm not an energy specialist.
Full	Enbridge may have impacted timing, not necessarily efficiency or amount. If they were not there we would have sought out others.
Full	Enbridge supported the internal work by providing guidance on features and grant.
Full	Enbridge works closely with our company and comes frequently to the site to help with energy use. We were looking for ways to improve our process and get help with our capacity needs. They came up with a few different ideas including the one they installed and looking at strainers or filters. Enbridge helped influence our decision to pick what was installed (the tank) as it would be a good long term cost savings, where the other ideas would increase maintenance costs. We may have done this same project without the funding, 50/50 chance because other projects may have come before this one. Basically, we have limited funding available for a long list of projects and this one may have been pushed down the list or others been selected as more important. This also influences the timeline for the project. It may have been several years before we did this project without Enbridge's financial help.
Full	Enbridge's incentive helped because we would not have been able to implement the boiler controls and the type of boiler at the same time/ quality. We would have also been in a financially tight situation after installing the glass roof. We had a great experience with Enbridge previously and they were able to help us again.
Full	Greater efficiency possible with the financing from Enbridge. It got us over the hurdle. We had the confidence to invest. We speak very highly of the Enbridge.
Full	In working with Enbridge we were able to increase our insulation from 1-inch to 2-inches. Alot of these initiatives with Enbridge are brought to completion with their support and them checking up with us. Without them things can be left on the backburner and delayed. With Enbridge, we were able to complete it in a timely manner and complete our desired efficiency and amount.
Full	Incentives were the biggest influence.
Full	It would be conflict of interest to suggest a vendor they did give suggestions of features that would be desirable.
Full	Mainly completed for natural gas reduction and other benefits. Without the support and incentives, the projects were unlikely to be done in the foreseeable future.
Full	Same timing.
Full	The Enbridge program allowed for these two projects to be completed at a higher efficiency or provide more energy savings. Quantity - the controls would have been installed but with the incentive there is increased energy efficiency. For the insulation measure it was only completed due to the incentive. Timing, the controls would have been installed, but not the insulation without the programs influence.
Full	The funding was key to getting approval for the project that allows us to improve our energy efficiency, which is very important to our organization.
Full	The program had a significant impact on these measures being installed. This is a new <number> acre greenhouse. It would not have been built without the financial and technical assistance of the program. We don't know how long we would have waited to build it if there wasn't program assistance. The program allowed to additional efficiency for all three measures. The pre build calcs propelled the decision to go with

Attribution	Dat4. Summarize the program's effect on the timing, efficiency, and amount that you installed.
	higher efficiency on all the measures (thickness of insulation, the hoist vs no hoist for a second laying of berries to be grown, and the control would have been far less advance without the programs help.
Full	This project was Enbridge driven.
Full	We installed vent seals with the help of funding from Enbridge. Without the incentives, the equipment would have stayed the same and the same quantity, they would just do it over a longer period of time in phases, or not at all. About a 25% likelihood of doing the project. The contact said you either do it or you don't, the efficiency and quantity do not change.
Full	We would have installed 50/50 sensors and 2 years later. Probably, fewer sensors too.
Full	We would have waited longer without the incentive, but it didn't effect the efficiency or amount of pipe insulation.
Full	We would not have installed it without the assistance of Enbridge. Maybe if we monitored for 3-5 years, we would have considered installing it.
Full	We wouldn't have done the project without Enbridge's help. Not sure how many years we would have waited.
Full	Without the assistance we wouldn't have installed a condense boiler. We might have installed a used less efficient boiler at the same time. We needed to install 2 boilers when we install everything else in the building.
Full	Without the incentive we would have not likely installed the measure. Maybe we would have installed it 2 to 5 years later but the incentive allowed us to prioritize it.
None	Basically, no rebate. It's a small percentage of project cost.
None	Curtains were the best to retain the heat they required in the greenhouse and for the crops.
None	Enbridge helped us more with the endwall because we didn't know it would fall under the incentive. He got it really working well and they both did a phenomenal job efficiency and quantity wise anyway.
None	Enbridge's assistance was very good in helping us understand and file for the incentive. We were going to do everything as we did regarding timing, efficiency and quantity but they were helpful.
None	It was 50/50 if we were going to install it but we would have installed a similar process, at the same time, with a similar amount of efficiency. The funding helped install it.
None	Of the 3 projects, this third project would have been the first to be on the chopping block. We hadn't considered installing door sensors to ensure doors are closed properly throughout the facility.
None	The influence was helpful financially.
None	The same number of boilers would be installed. We had to select the biomass from a limited range of capacities/size
None	We made decisions that were best for the business with little to no influence from Enbridge.
None	We would have done the same quantity, at the same time without the program. However, we have participated in this program for years (for steam traps) so there is program influence, since the projects are often back to back years. We had already planned the quantity and timing for this 2023 project so we would have done it regardless of the incentive.
None	Without the assistance, there would have been 50/50 chance. Approvers would have requested incentive in order to move forward.
None	Without the assistance, we would have been likely to install the 5 steam traps at the same time.
Partial	<name> made the major impact. I likely would have figured it out but it would have taken me longer. With <name>'s experience I was able to get everything done quickly. She even gave us advice to improve our thermostats and that impacted our operations across Canada. The incentive did not change the timing efficiency or amount installed but <name> made the experience easier and gave us guidance on the integrated control and smart thermostats, the associated technology and advantages.
Partial	Enbridge had a major influence in our decision for this measures. Without their support we may not have moved forward with this measure in 2023. Maybe at a later date
Partial	Enbridge helped us confirm our guidelines on the right path, and increase the size of the installation, although the timing and efficiency was not impacted because it was a new building
Partial	Enbridge's funding helped this project get approval due to the high cost. it is still very likely we would have done the project. The quantity would have stayed the same number of heat exchangers due to the way the <industry> process works, the main change would have been size and efficiency. We would have installed smaller heat exchangers with less efficiency.

Attribution	Dat4. Summarize the program's effect on the timing, efficiency, and amount that you installed.
Partial	It is difficult to know/calculate if without the incentive we would have had to go with a lower efficiency. The way it was calculated was all together so I am not sure. We would have had to install the same quantity at the same time due to the project timing (building of new greenhouse).
Partial	It made the project get done a year earlier, we would have gone with safe efficiency without the program and amount.
Partial	The program motivated the company to install them earlier and a higher efficiency, although they would have somewhat likely have done the project eventually. Not sure how long they would have waited.
Partial	The program was very influential in getting us to get the oil tank insulated. Without the project the tanks could have gone many years not being insulated. Out of the 15 large 34 oil tanks, three did not have insulation. We were spending $70,000/month in energy to heat the oil tanks so the oil would flow during the winter.
Partial	The wall needed to be insulated. We could have been done it a bit later but the funding provided at that time helped move the project forward
Partial	They were key to the decision
Partial	We would have been somewhat likely to install the same exchanger about a year later than we would have since we got the incentive. Probably would have landed on selecting a similar exchanger to meet our needs.
Partial	We would have installed curtains at the same time but would have been more at the shading criteria. We need the shading for the low light crops so we would have needed to install it no matter what but would have focused on shading material rather than heat retention.
Partial	We would have installed exactly the same system regardless of Enbridge's assistance, same efficiency, same quantity. The only change is it may have been up to 1 year later due to the high cost. Enbridge helped us install it at an earlier time.
Partial	We would have installed two of the four air curtains at the same time, but the incentive helped us do all four.
Partial	We would have needed to install something at the same time but would have gone with double layer.
Partial	Without the assistance it would have been likely that we would have installed a cheaper, less efficient set of curtains at the same time.
Partial	Without the assistance, approvers might have delayed asking to get an incentive for approval.
Partial	Without the assistance, it would have been hard to convince management to move forward. We needed to install the air compressor for funding alongside the VFD install.
Partial	Without the assistance, we would have been less likely to install the controls. We may have done it later, and would have installed 1 or 2, instead of all 3.
Partial	Without the funding assistance, we would have not completed the survey every year and would have taken longer to identify which of the 12 traps were failing but still would have tried to replace all 12.
Partial	Without the program, it would have been likely that we would have replaced the steam traps but we would have done it maybe a year later, and would have replaced 10-20% less. In other words, would have replaced only 8 instead of 10 overall.
Partial	Without the program, we would have done only about 15% of the project, and maybe in a year or so.
Partial	Without the technical assistance, we may have gone to our contractor, <contractor_name>, to get a recommendation on what to install. They may have recommended something similar to install at the same time but not sure. Financial incentive was small but the project was also inexpensive. Enbridge's support helps get necessary approvals and lends legitimacy to the project for company high ups.

Large Volume

Table D-9. Timing verbatim responses for Large Volume

Timing	Dat1a_O. Why do you say that?
Yes	Because it's a top tier project it would have still been done at that time.
Yes	Funding for a project is always helpful to accelerate things.
Yes	If we did it later, it would have had to wait a year until the scheduled outage to do the replacement.
Yes	It wasn't an obvious solution and without the suggestions and incentives from Enbridge. They set us down the path.

Timing	Dat1a_O. Why do you say that?
Yes	The incentive influenced the project but it also depended on the facilities' shutdown period.
Yes	The incentive sped it up due to the high cost.
Yes	Without Enbridge's funding, we would have delayed it a year.
No	Done routinely every year based on reset budget.
No	No impact on project going ahead or timing.
No	Our timeline was based on the availability of engineers.
No	The project justified itself financially and otherwise before the incentive. The Enbridge incentive made the project more compelling, but we had already decided to go ahead.
No	The steam trap repairs and replacements are on a set schedule.
No	The timing of the project would have been the same.
No	The timing would have happened at the same time.
No	This is something we do every year.
No	Timing wouldn't change to much because cleanings are based on the availability of staff.
No	We clean the heat exchangers based on a routine schedule
No	We clean these heat exchangers on a regular schedule.
No	We do it routinely every year based on reset budget.

Table D-10. Efficiency verbatim responses for Large Volume

Efficiency	Dat2a_O. Why do you say that?
Yes	We would have done fewer bundles or delayed the project.
Yes	We wouldn't have implemented the project without Enbridge's assistance.
Yes	Without Enbridge's financial assistance, we would have done less cleanings because that's what the budget allowed.
No	Boiler projects are fairly standard.
No	It was based on the needs of the plant.
No	Replacements are standard practice. We replace like for like.
No	The heat exchangers would have been cost justified without the financial incentives.
No	The scale of the project would have been the same.
No	The scope would have been the same without assistance.
No	This cleaning is something we do every year.
No	We had to abide to <company_name> specs , so we couldn't deviate from these.
No	We only did this because we had support from Enbridge.
No	We scoped out the size of the project and were able to justify the financials with the current scope.
No	We use various analysis tools to determine which heat exchangers have the most severe fouling and this analysis, and the associated cost considerations, drives which exchangers get cleaned.
No	We would have cleaned fewer heat exchangers without Enbridge's assistance.

Table D-11. Quantity verbatim responses for Large Volume

Quantity	Dat3a_O. Why do you say that?
Yes	The incentives helped us do more steam traps than we would have otherwise.
Yes	We would have clean 5 instead of 6 cleanings.
Yes	Without the Enbridge incentives we would have cleaned fewer (e.g. 15 instead of 18).
No	Our heat exchangers cleaning is based on analysis done on fouling rates, therefore we don't need incentives to justify it.
No	The number of steam traps get built into our maintenance budget and so this money is already allocated before consideration of the rebates.
No	We had done a lot of research to make sure that the new 9,000 hp compressor could match all the necessary functions of the old 11,000 hp compressor.
No	We use various analysis tools to determine which heat exchangers have the most severe fouling and this analysis, and the associated cost considerations, drives which exchangers get cleaned.

Table D-12. Dat4 verbatim responses for Large Volume

Attribution	Dat4. Summarize the program's effect on the timing, efficiency, and amount that you installed.
Full	The Enbridge money allows us to do more heat exchange cleaning for the following year. We have also reduced the intervals between cleanings, and the extra money from Enbridge makes it easier for us to practice more frequent cleanings.
None	Directly, the incentives did not have much impact on the steam trap project per se but the financial incentive helps us afford other EE projects.
None	No impact on project going ahead, timing or size of project.
None	The Enbridge incentives had no impacts on the timing or scale of the project.
None	The Enbridge incentives really had no impact on the timing or scale of the heat exchanger project.
None	The timing would have happened at the same time and the scale of the project would have been the same. At the time of this decision, there was some uncertainty of the incentive about the financing.
None	We meet with Enbridge regularly and this project came on their capex project list and we alerted them. The project became more concrete, Enbridge reps told us how much dollar incentive we would receive. However, the timing, efficiency, and size of the project would have been the same.
Partial	Enbridge incentives gave us the ability to do more heat exchangers cleanings than we would otherwise be able to afford with their opex budget. Timing wouldn't change too much because cleanings are based on the availability of staff.
Partial	The incentives are helpful in justifying the projects to go forward, especially in cases where the financials are borderline rather than delaying the projects.
Partial	This Enbridge program is mentioned in the steam trap project kickoff meeting, it gives this project a bigger push, and by broadcasting that to each business team to help put light on the project .
Partial	We have a great partnership with Enbridge and work with them to come up with different EE projects and bounce ideas off of them.

APPENDIX G. ATTRIBUTION RESULTS WITH ADDITIONAL STATISTICS

The results in this section are not applied to calculate savings totals. These results are different aggregations of the data that provide additional information to the programs and stakeholders. In the tables, results with less than five completes or absolute precision (±) greater than 20% are not shown, but the categories remain in the table to provide context for the results that can be reported.

The final table in each section has the application domain, Segment, which is the same domain as in the body of the report. Unlike the body of the report, these values are reported with finite population corrected (FPC) errors. FPC errors provide a more appropriate estimate of error for applying results onto populations that were part of the sample frame, i.e. the 2023 program year.

Overall ratios in these tables are the sample weighted average and not used in calculating net savings for the programs.

Custom Commercial Program

Table E-1. Applied domains with additional statistics for Custom Commercial program

Segment	Free-ridership-based attribution	Sample customers	Sample measures	±FPC on	± FPC off	Population measures	Percent population m^3 savings
Commercial	66%	32	38	12%	13%	363	22%
Institutional	74%	19	24	14%	29%	42	41%
Market Rate Multi-Residential	66%	32	35	9%	10%	476	37%
Custom Commercial - Overall	69%	83	97	7%	12%	881	100%

Table E-2. Targeted sample domain for Custom Commercial program

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± FPC on	± FPC off	Population measures	Percent population m^3 savings
Commercial - Boilers	68%	14	14	20%	21%	212	12%
Commercial - Other Commercial	58%	16	21	15%	20%	137	8%
Commercial - Steam Traps	***	3	3	7%	8%	14	2%
Institutional - Other Institutional	81%	15	17	14%	31%	25	36%
Institutional - Steam Traps	***	7	7	24%	29%	17	5%
Market Rate Multi-Residential - Boilers	65%	17	18	11%	11%	314	21%
Market Rate Multi-Residential - Other	68%	15	17	15%	18%	162	16%
Custom Commercial - Overall	60%	83	97	7%	12%	881	100%

Custom Industrial Program

Table E-3. Applied domains with additional statistics for Custom Industrial program

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± FPC on	± FPC off	Population measures	Percent population m^3 savings
Agricultural	63%	31	49	8%	17%	190	48%
Industrial	64%	46	58	7%	13%	163	52%
Custom Industrial - Overall	63%	77	107	6%	11%	353	100%

Table E-4. Targeted sample domain for Custom Industrial program

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± FPC on	± FPC off	Population measures	Percent population m^3 savings
Agricultural - New Construction	42%	9	18	12%	25%	79	19%
Agricultural - Retrofit	79%	25	31	5%	14%	111	29%
Industrial - HVAC	70%	14	17	8%	19%	36	15%
Industrial - Process	74%	19	20	11%	19%	48	17%
Industrial - Steam or Hot Water System	70%	14	16	5%	28%	50	16%
Industrial - Steam Traps	***	5	5	26%	29%	29	4%
Custom Industrial - Overall	63%	77	107	6%	11%	353	100%

Large Volume

Table E-5. Applied domains with additional statistics for Large Volume

Segment	Free-ridership-based attribution	Sample customers	Sample measures	± FPC on	± FPC off	Population measures	Percent population m^3 savings
Large Volume	28%	14	20	4%	16%	31	100%

APPENDIX H. FREE RIDERSHIPSENSITIVITY ANALYSIS

Five sensitivity analyses were performed to assess the influence of DNV assumptions in the participant FR scoring method. These scores are not intended for application in determining program net savings. We grouped the five sensitivity tests into three dimensions, two of which we tested in two ways:

1. What is the sensitivity of the attribution score to our assumption of 2 years for the acceleration period? We tested this two ways:

> 1a. Using an assumption of 1 year rather than 2 years when the acceleration period is equivalent to a "never would have implemented" response (100% FR-based attribution) for all measures in all programs. Mathematically, this increases attribution and helps inform us how much the assumption matters.
>
> 1b. Using an assumption of 4 years rather than 2 years when the acceleration period is equivalent to a "never would have implemented" response (100% FR-based attribution) for all measures in all programs. Mathematically, this decreases attribution and helps inform us how much the assumption matters.

2. What is the sensitivity of the attribution score to the scoring approach for efficiency?

> 2.Giving 100% FR-based attribution to programs for customers who say they would have done a different efficiency than what they did, rather than FR-based attribution that ranges from partial to full based on a later response. Mathematically, this increases attribution and informs us how much the assumption matters.

3. What is the sensitivity of the attribution score to the scoring methodology change from previous studies to the current study? We tested this two ways:

> 3a. Calculate results using the life cycle net savings (LCNS) scoring method. This is consistent with the sensitivity test #1 in the 2017-18 FR evaluation. This will test the sensitivity of results to the combined effect of measure life weighting of results and the different treatment of acceleration period savings.
>
> 3b. Calculate results using the life cycle net savings (LCNS) scoring method and include vendor attribution. This is consistent with the sensitivity test #1 in the 2017-18 FR evaluation, but adds back in vendor effect. This will test the sensitivity of different methodologies for participant scoring to adding in vendor effect.

Across the programs, the high-level findings from each test are:

1: Tests 1a and 1b indicate that changing the "never would have implemented" assumption would have a significant effect on the industrial and large volume segments, suggesting that we should include future research to verify the assumed planning horizon for these projects. Changing the assumption from 2 years to 4 years had a larger effect than changing from 2 years to 1 year, though the ratios still changed by 9%–10%.

2: Test 2 indicates that the specific scoring of the efficiency question has relatively little effect on any segment. This may argue for using a simplified approach in future net-to-gross research in order to reduce survey length.

3: Test 3a shows a statistically significant large effect for Large Volume, but not as much of an effect on other programs and segments. The primary difference in the approaches is the incorporation of measure life both in the weighting of results and the individual measure free-ridership score. The muted difference in the LCNS vs the Y1NS in the scores is likely due in part to having the assumption of 2 years for "never would have implemented." Since more projects are scored as "never," the difference in score between the two methods is not as significant as it was with a 4-year assumption. Test 3b provides a way

for readers to see how comparable the LCNS results are for the full standard approach including vendor surveys, which is the likely approach that would have been taken if CCM remained the key metric for program goal achievement.

In Table F-1, the first column (standard approach, vendor) is the official free-ridership based attribution that corresponds to the body of the report, shown here at the segment level. To ascertain the results of the sensitivity analysis, the reader should compare columns (standard approach 1 year, standard approach 4 year, no partial efficiency, and LCNS no vendor) to the second column (standard approach, no vendor):

- The first column (standard approach, vendor) to the second column (standard approach, no vendor), to show the effect of including the results of the vendor survey.
- The second column (standard approach, no vendor) to the next four columns (Test 1a, Test 1b, Test 2, and Test 3a) to show the effect of the sensitivity analysis.
- The final column (test 3b) to the adjacent column (test 3a) to see the effect of including the results of the vendor survey in the LCNS method.
- The final column (test 3b) to the first column (standard approach, vendor) to see the relatively apples to apples comparison of the 2024 standard approach and the LCNS method when both include the results of the vendor survey.

Table F-1 shows the results of the sensitivity analysis by sector for the programs. None of the sensitivity tests 1, 2, or 3 produced a result that is statistically different from the “standard, no vendor” result (at 90% confidence), with the exception of the LCNS method (test 3a and 3b) vs standard approach for the Large Volume program. Enbridge motivated many measures in Large Volume to be accelerated between one and 23 months, which results in more savings in the standard scoring of this study than LCNS, which provides a literal years accelerated scoring for partial attribution that is relative to the measure life in LCNS, rather than 24 months as scored in the standard approach.

All segments showed some sensitivity (4%–17%) to the timing assumption for what constitutes an equivalent to “never” response (Test #1b). This is shown as a decrease in the FR-based attribution on test #1 vs standard. This indicates that across all segments a significant portion of participants indicated acceleration of between 2-4 years. Similarly, most segments, except for Institutional, showed some sensitivity to the timing assumption of 1 year (Test #1a).

Test #2, which removes baseline from the efficiency scoring by giving 100% credit for any project where the customer would have done a different efficiency from what they did, increases the FR-based attribution by 0% to 3%. None of the segment scores was particularly sensitive to this assumption.

Test #3a shows the LCNS method having a significant effect on Commercial and Large Volume projects, with less of an effect on Multifamily and Industrial projects. The smaller effect on multifamily and industrial is an indication that attribution/free ridership in these sectors tends to be more binary, with low frequencies of partial attribution.

Test #3b provides a view of what the LCNS effect is once vendor surveys are taken into account. The vendor surveys increase the LCNS in a similar pattern to what we see in the standard method.

Table F-1 Sensitivity analysis for Enbridge custom program segments

Program	Segment	Standard Approach: Year 1 Net Savings, Vendor	Standard Approach: Year 1 Net Savings	Test 1a: 1 year acceleration = Never	Test 1b: 4 year+ acceleration = Never	Test 2: No Partial Efficiency Score	Test 3a: Lifecycle Net Savings Method	Test 3b: Lifecycle Net Savings Method, Vendor
Commercial	Commercial	66%	51%	56%	46%	52%	43%	55%
	Institutional	74%	74%	74%	57%	74%	74%	74%
	Market Rate Multi-Family	66%	35%	38%	31%	38%	29%	60%
Industrial	Agricultural	63%	63%	66%	59%	70%	54%	54%
	Industrial	64%	64%	74%	53%	66%	62%	62%
Large Volume	Large Volume	28%	28%	44%	20%	28%	11%	11%

APPENDIX I. FREE-RIDERSHIP SURVEY DATA QUALITY CONTROL

This appendix includes summaries of survey responses used to conduct quality control (QC) on the scored FR-based attribution responses. The QC process involves comparison of scored question responses to responses to other questions in the same interview. Interviews with potentially conflicting responses are reviewed by the project manager (PM), who reads the entire interview before determining if an adjustment to a score is required. The options for adjusting a score include:

- Drop the measure from the sample – for very muddled responses
- Replace the inconsistent response with a "Don't Know" (effectively using the average if it is clear that there should be some FR-based attribution for the component, but unclear how much)
- Adjust the flagged score to more accurately reflect the intent of the respondent (employed in cases where there is overwhelming evidence of intent; for instance, the open-ended response says clearly what the score should be)

Table G-1 provides the count of measures adjusted for each utility and whether the adjustment increased (Inc) or decreased (Dec) FR-based attribution for that measure. In total, 17 out of 225 FR-based attribution scores were adjusted through this process, including 1 measure which was dropped. The percent of adjusted scores (8%) is consistent with the prior studies. Two measures had more than one dimension corrected.

Table G-1. PM quality assurance adjustments

PM Quality Assurance Status			Overall		
			Inc	Dec	Total
Total Measures Completed from FR IDIs					225
Not Adjusted					210
PM Adjustments from QA	Dropped				1
	Assign DNK Attribution due to unclear amount.	Timing	4	0	4
		Efficiency	0	0	0
		Quantity/Size	0	0	0
	Adjust Score Attribution Clear based on open, conflicted with scored response	Timing	5	1	6
		Efficiency	4	1	5
		Quantity/Size	3	1	4

APPENDIX J. SPILLOVER MEASURE SAVINGS DETAIL

Table J-1 shows the individual non-Enbridge program measures identified through the survey by measure type with the individual measure savings associated.

Table J-1. Individual spillover measures

Measure type	m^3 savings	CCM savings
Boiler controls	1,252	25,047
Boiler controls	7,338	146,758
Boiler controls	20,729	414,577
Boiler controls	345,580	6,911,600
Boiler economizer	11,100	222,008
Boiler economizer	26,861	537,222
Boiler economizer	77,934	1,558,686
Boiler system insulation – fittings	1,531	21,441
Boiler system insulation – fittings	8,737	122,316
Boiler system insulation – fittings	25,349	354,887
Boiler system insulation - pipes	1,531	21,441
Boiler system insulation - pipes	8,737	122,316
Boiler system insulation - pipes	8,973	125,628
Boiler system insulation - pipes	25,349	354,887
Boiler system insulation - tank	2,760	55,200
Boiler system insulation - tank	15,745	314,908
Boiler/furnace	5,529	110,570
Boiler/furnace	9,785	195,690
Boiler/furnace	12,746	254,920
Boiler/furnace	15,531	310,628
Boiler/furnace	47,676	953,529
Boiler/furnace	60,476	1,209,529
Boiler/furnace	216,184	4,323,684
Boiler/furnace tune-ups	49	985
Boiler/furnace tune-ups	1,137	22,750
Boiler/furnace tune-ups	1,334	26,688
Boiler/furnace tune-ups	1,493	29,861
Boiler/furnace tune-ups	1,598	31,950
Boiler/furnace tune-ups	1,992	39,832
Boiler/furnace tune-ups	2,013	40,265
Boiler/furnace tune-ups	2,219	44,379
Boiler/furnace tune-ups	3,037	60,750
Boiler/furnace tune-ups	3,072	61,435
Boiler/furnace tune-ups	7,349	146,981
Boiler/furnace tune-ups	8,813	176,258
Boiler/furnace tune-ups	9,031	180,613
Boiler/furnace tune-ups	10,154	203,089
Boiler/furnace tune-ups	11,072	221,443
Boiler/furnace tune-ups	12,206	244,123
Boiler/furnace tune-ups	27,804	556,081
Burner upgrades or new installs	1,252	25,047
Burner upgrades or new installs	7,338	146,758
Burner upgrades or new installs	21,241	424,820
Climate control upgrades	10,168	152,525
Climate control upgrades	25,410	381,150
Climate control upgrades	45,196	677,941

Measure type	m^3 savings	CCM savings
Climate control upgrades	49,365	740,479
Climate control upgrades	111,231	1,668,465
Climate control upgrades	113,979	1,709,689
Climate control upgrades	521,693	7,825,388
Climate or system controls	6,720	100,802
Climate or system controls	10,168	152,525
Climate or system controls	12,196	243,922
Climate or system controls	25,741	386,117
Climate or system controls	78,971	1,184,561
Climate or system controls	115,310	1,729,643
Climate or system controls	695,207	10,428,101
CO_2 condenser	26,861	537,222
CO_2 condenser	79,860	1,597,198
Destratification fans	22,307	334,608
Doors	1,996	19,962
Doors	11,388	113,881
Doors	33,041	330,411
Doors	34,253	342,526
Equipment for ag process, e.g. biomass combustor, optimization	131,846	1,318,463
Greenhouse energy curtains for roof	16,528	165,280
Greenhouse energy curtains for roof	25,273	252,730
Greenhouse energy curtains for roof	32,129	321,288
Greenhouse energy curtains for roof	48,182	481,822
Greenhouse energy curtains for roof	90,596	905,960
Greenhouse energy curtains for roof	131,864	1,318,639
Greenhouse energy curtains for roof	132,284	1,322,841
Greenhouse energy curtains for roof	141,480	1,414,797
Greenhouse energy curtains for roof	299,245	2,992,452
Greenhouse glazing for walls	4,173	83,452
Greenhouse vent seals	14,461	216,915
Greenhouse vent seals	29,581	443,712
Heating system upgrade from steam to hot water	15,531	310,628
Loading dock door sealing	1,996	19,962
Loading dock door sealing	11,388	113,881
Loading dock door sealing	33,041	330,411
Loading dock door sealing	34,253	342,526
Other heat recovery	737	14,737
Other heat recovery	12,196	243,922
Production increase	2,756	13,778
Production increase	5,480	27,402
Production increase	10,158	50,789
Production increase	11,036	55,180
Production increase	17,520	87,600
Production increase	19,307	96,533
Production increase	20,462	102,308
Production increase	23,902	119,510
Production increase	40,893	204,464
Production increase	42,071	210,355
Production increase	49,410	247,052
Production increase	54,270	271,351
Production increase	55,208	276,040
Production increase	55,783	278,914

Measure type	m^3 savings	CCM savings
Production increase	73,309	366,543
Production increase	104,595	522,973
Production increase	106,056	530,279
Production increase	124,561	622,803
Production increase	133,763	668,813
Production increase	150,071	750,355
Production increase	154,095	770,474
Production increase	226,747	1,133,735
Production increase	316,090	1,580,451
Production increase	346,450	1,732,250
Production increase	352,300	1,761,500
Production increase	369,336	1,846,680
Production increase	382,879	1,914,393
Production increase	450,115	2,250,573
Production increase	461,679	2,308,394
Production increase	972,384	4,861,922
Production increase	990,596	4,952,979
Production increase	1,073,154	5,365,772
Roof insulation	3,449	86,226
Roof insulation	26,078	651,953
Roof insulation	57,089	1,427,216
Wall insulation	3,449	86,226
Wall insulation	7,059	176,484
Wall insulation	19,676	491,909
Wall insulation	40,249	1,006,227
Wall insulation	57,089	1,427,216
Wall insulation	59,182	1,479,548
Windows	731	14,628
Windows	3,048	60,964
Windows	4,173	83,452
Windows	12,106	242,128

Table J-2 shows an aggregated view of results by measure type, including percent of measure type savings influenced by Enbridge.

Table J-2. Influence on measure categories

Measure type	Sample customers	Sample sites	Reported measures	Weighted m3 savings	Percent weighted m3 savings	Percent Weighted m3 savings of Measure Type		
						Direct influence	Indirect influence	No influence
Production increase	28	32	32	18,577,990	59.9%	1%	17%	82%
Greenhouse Energy Curtains for Roof	9	9	9	2,993,858	9.7%	30%	25%	45%
Climate Control Upgrades	7	7	7	2,535,480	8.2%	65%	3%	33%
Climate or System Controls	7	7	7	1,663,771	5.4%	2%	0%	98%
Boiler controls	4	4	4	1,046,667	3.4%	0%	0%	100%
Boiler	7	7	7	935,255	3.0%	5%	0%	95%
Wall Insulation	6	6	6	538,323	1.7%	8%	4%	88%
Equipment for ag process, e.g. biomass combustor, optimization	1	1	1	389,987	1.3%	0%	50%	50%
Boiler tuneups	16	17	17	375,734	1.2%	2%	10%	88%
Boiler economizer	3	3	3	315,935	1.0%	19%	0%	81%
Roof Insulation	3	3	3	256,201	0.8%	0%	30%	70%
CO2 condenser	2	2	2	240,122	0.8%	25%	0%	75%
Loading Dock Door sealing	4	4	4	230,576	0.7%	0%	0%	100%
Doors	4	4	4	230,576	0.7%	11%	0%	89%
Boiler System Insulation - pipes	4	4	4	125,710	0.4%	0%	16%	84%
Greenhouse Vent Seals	2	2	2	120,034	0.4%	0%	0%	100%
Boiler system insulation – fittings	3	3	3	99,168	0.3%	0%	20%	80%
Burner Upgrades or New Installs	3	3	3	73,201	0.2%	30%	0%	70%
Destratification fans	1	1	1	65,982	0.2%	0%	0%	100%
Windows	4	4	4	56,377	0.2%	17%	0%	83%
Heating system upgrade from Steam to HW	1	1	1	45,940	0.1%	100%	0%	0%
Boiler system insulation - tank	2	2	2	43,591	0.1%	81%	0%	19%
Other heat recovery	2	2	2	38,254	0.1%	0%	0%	100%
Greenhouse Glazing for Walls	1	1	1	9,388	0.0%	100%	0%	0%

APPENDIX K. KEY DOCUMENTS

Four key documents previously reviewed by the EAC preceded this final report: the scope of work, which includes details on the methodologies and scoring used; the sample design memo; and the interview guides for participants and vendors.

Scope of work

Scope of Work - Final

Sample design memo

Sample Design Memo - Wave 2

Participant IDI guide

Ontario Gas FR 2023 - Participant IDI - Phas

Vendor IDI guide

Vendor IDI Guide

Agricultural Spillover Scope of Work

Scope of Work for OEB Spillover 2023

Agricultural Spillover survey guide

OEB 2023 Ag Spillover Survey

About DNV

DNV is an independent assurance and risk management provider, operating in more than 100 countries, with the purpose of safeguarding life, property, and the environment. Whether assessing a new ship design, qualifying technology for a floating wind farm, analyzing sensor data from a gas pipeline, or certifying a food company's supply chain, DNV enables its customers and their stakeholders to manage technological and regulatory complexity with confidence. As a trusted voice for many of the world's most successful organizations, we use our broad experience and deep expertise to advance safety and sustainable performance, set industry standards, and inspire and invent solutions.