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

July 14, 2023

VIA RESS AND EMAIL

Nancy Marconi
Registrar
Ontario Energy Board
2300 Yonge Street, 27th Floor
Toronto, ON M4P 1E4

Dear Nancy Marconi:

Re: Enbridge Gas Inc. (Enbridge Gas)
Ontario Energy Board (OEB) File No.: EB-2023-0062
2021 Demand Side Management (DSM) Deferral and Variance Account
Disposition Application - Interrogatory Responses

In accordance with the OEB's Procedural Order No 1, dated June 9, 2023, enclosed please find the interrogatory responses of Enbridge Gas.

If you have any questions, please contact the undersigned.

Sincerely,

Asha Patel

Digitally signed by Asha Patel
Date: 2023.07.14 09:44:56 -04'00'

Asha Patel
Technical Manager, Regulatory Applications

cc.: D. O'Leary (Aird & Berlis)
EB-2023-0062 Intervenors

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board Staff (STAFF)

Interrogatory

Reference:

(i) OEB Evaluation Contractor 2021 Natural Gas Demand-Side Management Annual Verification Report, Audit Opinion
(ii) EB-2023-0062 Application & Evidence, Exhibit A, Tab 2, Schedule 1

Preamble:

The following table summarizes the balances in the 2021 DSM Incentive Deferral Account and 2021 LRAM Variance Account for the EGD zone as reported by the OEB's Evaluation Contractor (EC) in its annual verification report and as requested for clearance by Enbridge Gas.

		Annual Verification Report	**As Requested for Clearance**
EGD Rate Zone	**DSM Incentive Deferral Account**	$4,961,553	$4,961,553
	LRAM Variance Account	$57,207	$37,476

The balances in the DSM Incentive Deferral Accounts are aligned, however the balances in the LRAM Variance Accounts are not.

Question(s):

a) Please explain why the balance being sought for clearance in the LRAM Variance Account for the EGD rate zone does not align with the balances as reported by the OEB's EC in its annual verification report.

b) Please provide the calculations and any other supporting evidence used to determine the balances that are being sought for clearance in the LRAM Variance Account for the EGD rate zone.

Response:

a) As described in Exhibit B, Tab 2, Schedule 1, page 4, the annual rate setting process in the EGD rate zone includes a DSM volumetric adjustment for the expected natural gas savings that are partially effective for the current year. The LRAMVA balance is the variance between the actual impact of DSM activities (2021 audited volume savings) undertaken by the natural gas utility and the forecasted impact included in distribution rates.

b) The EGD rate zone 2021 LRAMVA balance is shown in Exhibit B, Tab 2, Schedule 1, Appendix 2. Column (a) are the 2021 audited volumes and aligns with balances reported by the OEB's EC in its annual verification report (2021 Natural Gas Demand-Side Management Annual Verification Report, section 11.12.3, Table 11-144). Column (b) are the volumes already included in rates. Column (c) represents the variance, which is being sought for clearance.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board Staff (STAFF)

Interrogatory

Reference:

(i) EB-2023-0062 Application & Evidence, Exhibit B, Tab 2, Schedule 1, Appendix 4
(ii) EB-2023-0062 Application & Evidence, Exhibit C, Tab 2, Schedule 1, Appendix 4

Preamble:

The following table summarizes the principal balances, interest charges, and total balances for clearance in each of the 2021 DSM Deferral and Variance Accounts for both the EGD and Union rate zones.

		Principal Balance (thousands)	**Interest Balance (thousands)**	**Total Balance for Clearance (thousands)**
EGD Rate Zone	**DSM Variance Account**	$1,862.4	($57.6)	$1,804.8
	LRAM Variance Account	$37.5	$1.6	$39.1
	DSM Incentive Deferral Account	$4,961.6	$259.0	$5,220.6
Union Rate Zone	**DSM Variance Account**	($11,373.0)	($647.0)	($12,020.0)
	LRAM Variance Account	$1,470.0	$80.0	$1,549.0
	DSM Incentive Deferral Account	$697.0	$40.0	$737.0

Question(s):

a) Please confirm that the principal balances pertain only to natural gas demand side management programs funded over the 2021 calendar year.

b) Please identify the period over which the interest balances being sought have accrued.

c) Please provide the calculations used to determine the interest balances in each of the DSM deferral and variance accounts for the EGD and Union rate zones, as identified in the table above.

Response:

a) Please note that the values above for Union Rate Zone LRAM Variance Account and DSM Incentive Deferral Account have been transposed, i.e., LRAM Variance Account principal balance is $697.0 and DSM Incentive Deferral Account principal balance is $1,470.0.

   The principal balances requested for clearance pertain only to natural gas demand side management programs funded over the 2021 calendar year with two exceptions:

   1) The EGD Rate Zone DSM Variance Account includes balances deferred from previous years and utilized in 2021, please see Exhibit I.STAFF.3. Both EGD and Union Rate Zones DSM Variance Account balances also include amounts related to 2021 participants for customer incentive spend deferred to future years where incentives are paid once future milestones/activities are reached.

   2) The Union Rate Zone LRAM Variance Account spans multiple DSM program years due to the time lag between when audited results are finalized and when they are reflected in Union rate zones distribution rates. The 2021 balance includes volumes from 2019 through to 2021. Refer to Exhibit C, Tab 2, Schedule 1, Section 3, pp.4 to 8 for further details on Union rate zones LRAM Variance Account.

b) The interest applicable to the 2021 deferral balances was calculated over the period January 2022 through September 2023 under the assumption that balances are approved for disposition as of October 1, 2023.

c) Please refer to Attachment 1 to this interrogatory response for calculations supporting the accrued interest on an actual basis through March 2023 and forecast from April to September 2023.

Interest Details: LRAM, DSMVA, and DSMI

SAP Acct	Account name	Mar-2023	Apr-2023	May-2023	Jun-2023	Jul-2023	Aug-2023	Sep-2023	
179185.YY2021	Lost Revenue Adjustment Mechanism (2021)	753,356.00	697,467.00	697,467.00	697,467.00	697,467.00	697,467.00	697,467.00	
179111.YY2021	Demand Side Management Variance Account (2021)	(11,372,617.24)	(11,372,617.24)	(11,372,617.24)	(11,372,617.24)	(11,372,617.24)	(11,372,617.24)	(11,372,617.24)	
179115.YY2021	Demand Side Management Incentive (2021)	1,469,503.00	1,469,503.00	1,469,503.00	1,469,503.00	1,469,503.00	1,469,503.00	1,469,503.00	
	OEB Prescribed Interest Rate Deferral Accounts	4.73%	4.98%	4.98%	4.98%	4.98%	4.98%	4.98%	Note: OEB Prescribed Interest Rate for Q2 2023 subject to change

Deferral Interest		YTD [1] Mar-2023	Apr-2023	May-2023	Jun-2023	Jul-2023	Aug-2023	Sep-2023	Total Interest Forecast to be cleared Oct 1 2023
179451.YYLR21	Lost Revenue Adjustment Mechanism (2021)	22,409.61	3,126.43	2,894.49	2,894.49	2,894.49	2,894.49	2,894.49	40,008.48
179451.YYDS21	Demand Side Management Variance Account (2021)	(364,101.29)	(47,196.36)	(47,196.36)	(47,196.36)	(47,196.36)	(47,196.36)	(47,196.36)	(647,279.46)
179451.YYDI21	Demand Side Management Incentive (2021)	43,063.22	6,098.44	6,098.44	6,098.44	6,098.44	6,098.44	6,098.44	79,653.84

Notes:
(1) Interest accrued from January 2022 through March 2023

Interest Details: LRAM, DSMVA, and DSMI

Oracle Acct	Account name	Mar-2023	Apr-2023	May-2023	Jun-2023	Jul-2023	Aug-2023	Sep-2023	
19553.YY2021	Lost Revenue Adjustment Mechanism (2021)	37,476.00	37,476.00	37,476.00	37,476.00	37,476.00	37,476.00	37,476.00	
19551.YY2021	Demand Side Management Variance Account (2021)	1,862,404.30	1,862,404.30	1,862,404.30	1,862,404.30	1,862,404.30	1,862,404.30	1,862,404.30	
19557.YY2021	Demand Side Management Incentive (2021)	4,961,553.00	4,961,553.00	4,961,553.00	4,961,553.00	4,961,553.00	4,961,553.00	4,961,553.00	
	OEB Prescribed Interest Rate Deferral Accounts	4.73%	4.98%	4.98%	4.98%	4.98%	4.98%	4.98%	Note: OEB Prescribed Interest Rate for Q2 2023 subject to change

Deferral Interest		YTD [1] Mar-2023	Apr-2023	May-2023	Jun-2023	Jul-2023	Aug-2023	Sep-2023	Total Interest Forecast to be cleared Oct 1 2023
19554.YY2021	Lost Revenue Adjustment Mechanism (2021)	654.83	155.53	155.53	155.53	155.53	155.53	155.53	1,587.98
19552.YY2021	Demand Side Management Variance Account (2021)	(103,960.19)	7,728.98	7,728.98	7,728.98	7,728.98	7,728.98	7,728.98	(57,586.32)
19558.YY2021	Demand Side Management Incentive (2021)	135,495.26	20,590.44	20,590.44	20,590.44	20,590.44	20,590.44	20,590.44	259,037.93

Notes:

(1) Interest accrued from January 2022 through March 2023

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board Staff (STAFF)

Interrogatory

Reference:

(i) EB-2023-0062 Application & Evidence, Exhibit B, Tab 2, Schedule 1
(ii) EB-2023-0062 Application & Evidence, Exhibit C, Tab 2, Schedule 1

Preamble:

Consistent with previous OEB Decisions and the OEB's Mid-Term Review Report, the respective rate zones' DSM Variance Account is used to track amounts for customer incentive spend deferred to future years for offerings where incentives are paid when future milestones/activities are reached for both the EGD and Union rate zones.

Question(s):

a) Please identify whether the current balances being sought for clearance in the EDG and/or Union rate zones' DSM Variance Account include balances deferred in previous years.

b) If so, please identify the rate zone, previously deferred amount, related DSM program, and rate year in which the deferral was recorded.

Response:

a) The EGD rate zone DSM Variance Account balance being sought for clearance includes balances deferred from previous years and utilized in 2021. The Union rate zones DSM Variance Account balance does not.

b) Please refer to the continuity schedule of the deferred incentive balances for EGD rate zone's Residential Savings by Design (RSBD), Commercial Savings by Design (CSBD) and Affordable Housing New Construction (AHNC) offerings at Exhibit B, Tab 2, Schedule 1, Appendix 1. The withdrawals columns are deferred from previous years and utilized in 2021 and shown by the rate year in which the remaining deferral was recorded. Union rate zones continuity schedule of deferred incentives balances is found at Exhibit C, Tab 2, Schedule 1, Appendix 1.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board Staff (STAFF)

Interrogatory

Reference:

(i) EB-2023-0062 Application & Evidence, Exhibit A, Tab 4, Schedule 1, Sections 8.4 and 9.4
(ii) EB-2023-0062 Application & Evidence, Exhibit B, Tab 1, Schedule 1
(iii) EB-2023-0062 Application & Evidence, Exhibit C, Tab 1, Schedule 1

Preamble:

The following table provides a high-level budgetary summary of Enbridge Gas's DSM program spending for 2021 as it relates to the 2021 DSM Variance Account balance for both the EGD and Union rate zones.

Enbridge Gas reported that it underspent in the EGD rate zone's Low Income and Market Transformation programs. Furthermore, Enbridge Gas utilized the 15% overspend above its annual OEB-approved DSM Variance Account for its EGD rate zone's Resource Acquisition scorecard.

Rate Zone	OEB-Approved Program Budget	Utility Spending	Variance	Variance (%)
EGD	$63,939,485	$68,444,472	$4,504,987	7.05
Union	$58,707,541	$47,763,468	($10,944,073)	(18.6)

Enbridge Gas reported that it underspent in the Union rate zone's Commercial/Industrial, Low Income, Large Volume, Market Transformation, and Performance Based programs.

Question(s):

a) Please explain the factors and rational that led to the decision to utilize the 15% overspend in the DSM Variance Account for the EGD rate zone's Resource Acquisition scorecard.

b) Please explain the factors that resulted in the underspending seen in the EGD rate zone's Low Income and Market Transformation programs.

c) Please explain the factors that resulted in the underspending seen in the Union rate zone's Commercial/Industrial, Low Income, Large Volume, Market Transformation, and Performance Based programs.

d) Considering that the OEB-approved program budgets for the EGD and Union rate zones were relatively similar, please explain the factors that lead to the differing budgetary variances when comparing the two rate zones (i.e., a 7.05% overspend in the EGD rate zone, and an 18.6% underspend in the Union rate zone).

Response:

a) As outlined in the Filing Guidelines to the 2015-2020 DSM Framework[1]:

> *"The option to spend 15% above the approved annual DSM budget is meant to allow the natural gas utilities to aggressively pursue programs which prove to be very successful. Accordingly, the natural gas utility will be permitted to recover from ratepayers up to 15% above its annual DSM budget recorded in its DSMVA provided that:*
>
> *A) It had achieved its weighted scorecard target(s) (i.e., 100%) on a pre-audited basis for the program(s) prior to additional spending being made on those programs; and*
>
> *B) The DSMVA funds were used to produce results in excess of those targets (i.e., in excess of 100%) on a pre-audited basis."*

The Resource Acquisition scorecard for the EGD rate zone exceeded 100% of the weighted scorecard target on a pre-audited basis (it achieved 117%), and in accordance with the above, Enbridge Gas utilized the 15% in order to continue pursuing successful results.

The 2021 Resource Acquisition Scorecard Results for the EGD Rate Zone are shown in Table 8.1 of the 2021 DSM Annual Report, included in Exhibit A, Tab 4, Schedule 1, page 83 of 236.

b) - c)

As identified by OEB Staff, Enbridge Gas spent below the OEB-approved budget in the Low Income and Market Transformation programs in the EGD rate zone as well as in the Commercial/Industrial, Low Income, Large Volume, Market Transformation, and Performance Based Programs in the Union rate zones. The actual spend of the budget is largely correlated to program results, as the majority of the budget is allocated to participant incentives. When Enbridge Gas does not achieve targets, there is typically an underspend associated with that program.

[1] EB-2014-0134, Filing Guidelines to the Demand Side management Framework for Natural Gas Distributors (2015-2020), December 22, 2014, page 38.

As shown in Tables 8.2, 8.3, 9.1, 9.2, and 9.5 of the 2021 Annual Report[2], the EGD rate zone Low-Income and Market Transformation Scorecards, and the Union rate zones Resource Acquisition (which includes the results of the Commercial/Industrial Program), Low-Income, and Performance-Based Scorecards all achieved below the 100% target.

Enbridge Gas faced many challenges in 2021 which resulted in lower than anticipated results, and these are summarized in Section 5 Programs and Offerings (EGD Rate Zone), and Section 6 Programs and Offerings (Union Rate Zones) in the 2021 Annual Report. Some key challenges as outlined in the 2021 Annual Report are listed below by program.

- Low-Income (EGD Rate Zone)
  - The Home Winterproofing and Affordable Multi-Family Housing offerings were paused twice in 2021 due to the COVID-19 pandemic and local health restrictions, which limited the ability for Delivery Agents to enter customer homes.
  - After the offerings resumed, some customers still demonstrated hesitation for in-person visits.
  - Many social and private building operators deferred or cancelled capital improvements during the COVID-19 pandemic.
- Market Transformation (EGD Rate Zone)
  - All five of the offerings in the Market Transformation scorecard experienced challenges in 2021, including economic impacts of the COVID-19 pandemic.
- Commercial/Industrial (Union Rate Zones)
  - The COVID-19 pandemic continued to impact the commercial and industrial sector in 2021 due to ongoing restrictions across various regions throughout the year, and in many cases customers were simply focused on staying open. Many businesses faced competing priorities and impacts included cancellation of industry events and tradeshows, reduced capital budget due to decreased profits or increased spending for sanitization, high turnover in staffing, and in some cases constraints on business operations due to some staff working from home or reduced hours. Impacts were also felt in the supply chain causing shortages or longer than normal wait times for product shipping. Enbridge Gas found that getting financial commitment continued to be a challenge given customers' hesitancy to spend capital budget in times of uncertainty.
- Low-Income (Union Rate Zone)
  - The Home Winterproofing, Indigenous, and Affordable Multi-Family Housing offerings were paused twice in 2021 due to the COVID-19 pandemic and local health restrictions, which limited the ability for Delivery Agents to enter customer homes.

[2] Exhibit A, Tab 4, Schedule 1.

    - After the offerings resumed, some customers still demonstrated hesitation for in-person visits.
    - Many social and private building operators deferred or cancelled capital improvements during the COVID-19 pandemic.
- Performance-Based (Union Rate Zone)
    - Enbridge Gas did not achieve any results from the RunSmart offering as it was relying on a benchmarking pilot of school boards. As a result of the COVID-19 pandemic, the school boards were required to focus on ventilation and other capital projects and were unable to participate in RunSmart as anticipated.
    - Consistent with the 2015-2020 DSM Plan, 2018 was the last year new participants were enrolled in the Strategic Energy Management offering and as a result, very few participants were eligible for incentives in 2021.

There were two programs in the Union rate zones for which the spend was less than the OEB-approved budget and yet the results exceeded the 100% target. As shown in Tables 9.3 and 9.4 of the 2021 Annual Report[3], The Large Volume and Market Transformation Programs achieved 122% and 108% respectively, details of which are outlined below.

- The Large Volume Direct Access Offering uses a self-directed funding model, whereby each customer has direct access to the incentive budget they pay in rates, and if a customer elects not to participate, the funds are dispersed via an aggregated pool approach. As a result of this unique funding model, the Shareholder Incentive does not always align with results in the same manner as the other program scorecards. Despite being underspent, the limited set of Large Volume customers were not able to fully utilize the aggregated pool through additional DSM projects in 2021, partly due to the economic impacts of the COVID-19 pandemic.
- Enbridge Gas is committed to continuous improvement, striving for cost-effectiveness while achieving targets. Enbridge Gas was able to achieve the Market Transformation Program target while remaining under budget, largely as a result of the multi-year nature of the program offerings.

d) The overspend in the EGD rate zone compared to the underspend in the Union rate zone aligns with the results achieved in the scorecards in the respective rate zones. The discrepancy in results is apparent in the total portfolio Shareholder Incentive achievement for each rate zone.

   As outlined in the response to part b and c above, the COVID-19 pandemic impacted almost all aspects of Enbridge Gas offerings, including customer sentiment, suspension of programming, and economic effects such as supply chain shortages and employee turnover. While these were widespread, some factors affected the Union rate zones more acutely than the EGD rate zone, in particular supply chain shortages and employee turnover impacted rural communities more

[3] Exhibit A, Tab 4, Schedule 1.

than urban communities, which has a greater proportional impact in the Union rate zones. Enbridge Gas endeavoured to achieve targets in all programs and offerings across all rate zones and sectors, and tailored program design and delivery to address specific challenges, as outlined in Sections 5 and 6 of the 2021 Annual Report. However, Enbridge Gas was ultimately more successful in the EGD rate zone than the Union rate zones, and the spending is aligned with the results.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Ontario Energy Board Staff (STAFF)

Interrogatory

Reference:

(i) EB-2023-0062 Application & Evidence, Exhibit C, Tab 2, Schedule 1

Preamble:

Annual natural gas volumes for 2019 and 2020 were noted as 35,443 x 103 m3 and 42,686 x 103 m3, respectively, in the determination of the LRAM Variance Account balances for the Union rate zone.

Question(s):

a) Please provide the reference or calculation(s) used to determine the annual natural gas volumes for 2019 and 2020.

Response:

a) Full-year audited lost revenue volumes can be calculated by removing the monthly proration from the lost revenue volumes reported by the OEB's EC in its annual verification report (i.e. partial-year lost revenue volumes divided by the monthly install ratio = full-year lost revenue volumes).

Month	Ratio[1] (12-Month+1)/12	2019 Partial-Year LRAM Volumes[2] (10^3 m^3)	2019 Full-Year LRAM Volumes (10^3 m^3)	2020 Partial-Year LRAM Volumes[3] (10^3 m^3)	2020 Full-Year LRAM Volumes (10^3 m^3)
	a	*b*	*c = b /a*	*d*	*e = d / a*
January	1.0000	6,938	6,938	14,716	14,716
February	0.9167	2,573	2,807	2,426	2,647
March	0.8333	5,262	6,315	2,031	2,438
April	0.7500	632	843	731	974
May	0.6667	2,851	4,276	1,361	2,042
June	0.5833	1,510	2,588	1,408	2,413
July	0.5000	1,176	2,352	786	1,572
August	0.4167	1,145	2,748	570	1,368
September	0.3333	159	477	1,657	4,972
October	0.2500	464	1,855	812	3,248
November	0.1667	226	1,357	964	5,786
December	0.0833	241	2,887	43	512
TOTAL		**23,177**	**35,443**	**27,505**	**42,686**

[1] 2019 Natural Gas Demand-Side Management Annual Verification Report, Appendix L, Table 11-128
[2] 2019 Natural Gas Demand-Side Management Annual Verification Report, Appendix M, Table 11-144
[3] 2020 Natural Gas Demand-Side Management Annual Verification Report, Appendix L, Table 11-145

ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance

Interrogatory

Reference:

2021 Natural Gas Demand-Side Management Annual Verification Report prepared by the Evaluation Contractor, DNV. Exhibit A, Tab 3, Schedule 1, Page 4.

Question(s):

a) Please provide a copy of the 2021 Natural Gas Demand-Side Management Annual Verification Report prepared by the Evaluation Contractor, DNV.

b) Please provide a summary of the recommendations made by DNV regarding the 2021 Demand Side Management programs. In this summary, please inform us which recommendations have been made in previous years and what was the response by Enbridge Gas Inc.

c) Taking into account that at the moment of the report prepared by the Evaluation Contractor, DNV, this company was studying and comparing "the savings estimates from Enbridge Gas Inc.'s digital tool (eTools) with those estimated by modeling site-level energy usage from customer bills" and, therefore, the Evaluation Contractor did not provide conclusions regarding that investigation, please:

    i. Please inform us if the Evaluation Contractor finished the investigation regarding the comparison hereby mentioned.
    ii. If so, please inform us about the investigation's results.
    iii. Please provide a copy of the report or analysis delivered by the Evaluation Contractor.
    iv. Please inform us what is the relationship between the digital tool (eTools) and DSM shareholder incentives.

Response:

a) The 2021 Natural Gas Demand-Side Management Annual Verification Report prepared by the Evaluation Contractor, DNV, is provided at Attachment 1.

b) The recommendations made by DNV regarding the 2021 Demand Side Management programs are included in Section 10 Findings and Recommendations of the 2021 DSM Annual Verification report provided as Attachment 1. This section

provides a previously recommended status and includes the utility response to each recommendation.

c) i. Yes, the Evaluation Contractor has finished the eTools Boiler Tool Validation Study.

ii. Through the eTools Boiler Tool Validation Study, DNV found the following:

> "eTools is a sophisticated engineering-based estimation calculator that exceeds industry standard practice and generates local knowledge of implementation practices. There are no other boiler savings estimation models that are known to be more accurate, nor any known to be in development. Changing tools for evaluation will introduce additional uncertainty as to the causes of differences in verified vs. claimed savings."[1]

Full Conclusions, including Implementation and Evaluation Recommendations can be found in Section 3.12 of DNV's eTools Validation Report.

iii. The final version of the eTools study can be found at Exhibit I.SEC.1, Attachment 1.

iv. The Executive Summary of DNV's eTools Validation Report noted the following:

> "EGI uses eTools to estimate gas savings from the installation of energy-efficient boiler equipment offered through EGI's Custom Commercial Program and Affordable Multi-Family Housing Program. These programs, approved by the Ontario Energy Board (OEB) as part of EGI's broader natural gas demand side management (DSM) portfolio, offer customers incentives and guidance related to specific retrofits at their buildings which typically include efficiency upgrades to the boilers.
> …
>
> Gas consumption savings in eTools are estimated (ex ante) utilizing pre-period gas consumption and detailed engineering assumptions. The OEB has accepted these estimates as part of its evaluation process and subsequently, to calculate performance incentives and lost revenues."[2]

[1] Exhibit I.SEC.1 Attachment 1, p. 5.
[2] Exhibit I.SEC.1 Attachment 1, p. 4.

DNV

ONTARIO GAS DSM EVALUATION CONTRACTOR

2021 Natural Gas Demand-Side Management Annual Verification Report

Ontario Energy Board

Date: 01 November 2022

DNV

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AUDIT OPINION

Enbridge Gas Inc. (formerly Enbridge Gas Distribution Inc. and Union Gas Limited)[1] implemented energy conservation programs designed to reduce natural gas use at participating customer's homes and businesses throughout the 2021 calendar year. The programs were approved by the Ontario Energy Board (OEB) and were available to all types of natural gas customers, including residential, low income, commercial, and industrial.

The energy conservation programs, called demand-side management (DSM) programs, are regulated by the OEB. The OEB establishes policy guidance, holds public hearings to determine the merit of utility proposals, and approves the use of ratepayer funding for the utility to implement the programs. Depending on the level of success in meeting its annual OEB-approved targets, the utility may be eligible for a performance incentive, called the shareholder incentive. The maximum possible shareholder incentive for each legacy utility is $10,450,000, although this amount is only available if performance meets 150% of all OEB-approved targets. The utility may claim lost revenue as a result of the lower natural gas sales.

The Evaluation Contractor team[2] (DNV and Dunsky) provides the following opinion on the achieved natural gas savings, lost revenue, shareholder incentive, and cost effectiveness of the DSM programs offered by Enbridge and Union for the calendar year ending December 31, 2021.

Our opinion stems from our review of the program documentation, utility shareholder incentive calculations, and lost revenue calculations as set forth in the report that follows. It is also based on the information available at the time that this report was published.

In our opinion, the following figures are reasonable, subject to the qualifications given above.

Definition	Enbridge Results	Union Results
Shareholder Incentive	$4,961,553	$1,469,503
Lost Revenue	$57,207	$133,216
Verified Net Cumulative Energy Savings (m^3)	862,083,798	840,565,201[3]
Total Dollars Spent (not reviewed)	$69,619,780	$52,976,925
Benefit Cost Ratio (TRC-plus test)[4]	2.56	1.93

[1] Enbridge Gas Distribution Inc. (Enbridge) and Union Gas Limited (Union) amalgamated effective January 1, 2019 to become Enbridge Gas Inc. However, in 2021, Enbridge Gas Inc. continued to deliver the two legacy utility DSM plans in its different rate zones – EGD rate zone and Union rate zones (North and South). For ease of reference, throughout this report, the EC has referred to the legacy utility DSM plans as Enbridge and Union.

[2] DNV leads the Evaluation Contractor team and led the evaluation of the 2021 DSM programs, with contributions from Dunsky.

[3] The verified net cumulative energy savings value does not include the 3.55% savings from the Strategic Energy Management program, which is part of the Performance Based scorecard. This 3.55% savings are estimated to be 4,850,000 net cumulative CCM savings.

[4] The cost-effectiveness results use 2021 carbon tax rates that increase by $15 per year up to $170 per tCO2e in 2030. Beyond 2030, a 2% inflation rate is applied.

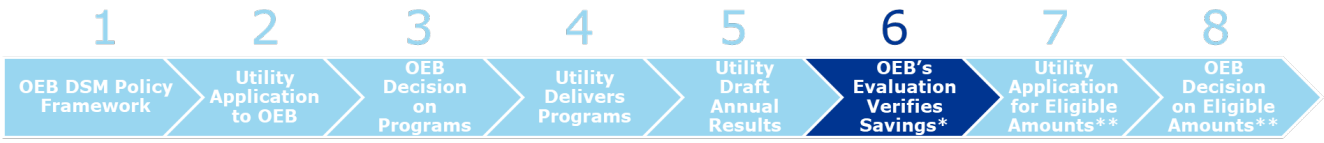
1 EXECUTIVE SUMMARY

Enbridge Gas Inc.[5] delivers demand-side management (DSM) programs under the Demand Side Management Framework for Natural Gas Distributors (2015-2020[6] and extended through 2022[7]) developed by the Ontario Energy Board (OEB). Through the framework development and approval of DSM plans, the OEB sets budgets, targets, and cost effectiveness thresholds, in addition to establishing a shareholder incentive for the successful delivery of the approved programs.

The OEB verifies, on an annual basis, natural gas savings and other aspects of energy conservation programs provided by Enbridge Gas Inc. and funded by ratepayers. The energy conservation programs are designed to reduce customer demand for gas through increases in energy efficient technologies and equipment using various methods such as financial incentives, building modifications, education, and outreach. These programs attempt to impact customers' energy usage (demand), rather than utility energy capacity (supply), which is why they are referred to as demand-side management programs.

This report provides results of the annual verification of natural gas DSM programs delivered in 2021 and offered by Enbridge Gas Inc. The verification was conducted on behalf of the OEB by its independent, third-party evaluation contractor (EC), the team of DNV and Dunsky.

The graphic below provides a general depiction of the broader process of creating DSM programs and their evaluation that led to this evaluation report.



*The OEB's EC conducts an expert, independent review to verify the program results, including natural gas savings and participants, and provides an opinion on the utility performance related to OEB-approved targets
**Eligible amounts include performance incentives the utility may be eligible to receive due to meeting or exceeding OEB-approved targets, lost revenues related to program-related natural gas savings, and changes to costs previously approved by the OEB

Independently verified program results, such as natural gas savings and the number of participants, provides important information to the OEB on the success and effectiveness of the programs and prudent use of ratepayer funding. Additionally, verified results are required for the utility to seek approval of any performance incentive related to OEB-approved targets. The financial incentive is to Enbridge Gas Inc.'s shareholders. The financial incentive is determined by reviewing the utility's accomplishments against their OEB-set targets, assembled in groupings called scorecards along with associated metrics that are used to determine program achievements. The degree of verified achievement (relative to the metric target) determines the shareholder incentive for each legacy utility DSM plan. The shareholder incentive is paid to the utility shareholders to encourage the utility to deliver DSM programs.

The annual verification uses the findings of any program-specific evaluation study applicable to the 2021 programs and applies them to the natural gas energy savings and achieved scorecard values reported by the utility to the OEB. For programs or metrics where no evaluation studies have been completed during the current evaluation, the EC team conducts a due diligence review of program documentation to verify the savings or metrics reported by the utilities.

[5] Enbridge Gas Distribution Inc. (Enbridge) and Union Gas Limited (Union) amalgamated effective January 1, 2019 to become Enbridge Gas Inc. However, the DSM framework and 2015-2020 DSM Plans were developed and approved by the OEB before amalgamation, and Enbridge Gas Inc. continues to deliver the two legacy utility DSM plans individually in its different rate zones – EGD rate zone and Union rate zones (North and South) through the remainder of the framework. As such, the EC still evaluates each DSM plan separately by legacy utility (Enbridge and Union). For ease of reference, throughout this report, the EC has referred to the legacy utility DSM plans as Enbridge and Union.

[6] EB-2014-0134

[7] EB-2019-0271, OEB Decision and Order on 2021 DSM Plans, July 16, 2020
EB-2021-0002, OEB Decision and Order on 2022 DSM Plans, August 26, 2021

The overall objectives are to provide an independent opinion on whether natural gas savings achieved through programs are reasonable, and that the corresponding DSM shareholder incentives and lost revenue amounts have been accurately calculated.

Table 1-1 and Table 1-3 show the verified, comprehensive scorecard results for the Enbridge and Union rate zones, respectively.

The OEB also requires the utility to deliver DSM programs that are cost-effective, which means the benefits produced by the programs outweigh the cost of their implementation (including the benefit of reduced use of natural gas, electricity, and water, the cost of those resources, and carbon emissions).[8] The methods that the EC used to calculate cost effectiveness in 2021 are the same ones used in the 2020 analysis. The cost effectiveness results (in terms of TRC-Plus benefit-cost ratio) for each program are found in Table 1-1 and Table 1-3 in the rightmost column. The bigger the number, the more cost effective the program is. These tables also show the amount of money spent by the utilities to implement the energy efficiency programs.

Table 1-2 and Table 1-4 show the verified revenues that Enbridge and Union lost, respectively, as a result of implementing DSM programs. The lost revenue is shown by rate class and is only the revenue lost during the 2021 calendar year.[9] A rate class is a group of customers that pay the same rate for their gas usage and service.

In summary:

- Enbridge programs offered in 2021 were verified to achieve:
  - Savings in 2021 of 45,753,945 m^3 (equal to heating 19,893 homes in Ontario for a year[10])
  - Cumulative savings of 862,083,798 m^3 (translating to emissions reductions of 1,686,811 tons of CO_2 equivalent[11])
- Union programs offered in 2021 were verified to achieve:[12]
  - Savings in 2021 of 48,136,107 m^3 (equal to heating 20,928 homes in Ontario for a year[13])
  - Cumulative savings of 840,565,201 m^3 (translating to emissions reductions of 1,644,706 tons of CO_2 equivalent[14])

In this report, we made several recommendations for the programs, focusing primarily on issues related to program data and documentation, energy modelling, and cost effectiveness.

At the time this report was published, the EC was continuing to study and compare the savings estimates from Enbridge Gas Inc.'s digital tool (eTools) with those estimated by modelling site-level energy usage from customer bills.[15] As this study was ongoing, we did not provide any conclusions from that investigation in this report.

[8] Cost effectiveness results for the 2021 programs do not reflect the significant gas price increases occurring in 2022.

[9] The lost revenue shown in these tables are not the entire lost revenue the utility realizes from its DSM programs. A forecast DSM amount, built into natural gas rates, accounts for a large majority of lost revenues.

[10] This calculation uses an average annual natural gas usage of 2,300 m^3 per year.

[11] This calculation uses cumulative savings, the federal carbon price, and the prescribed charge rate for marketable gas in Ontario.

[12] The first-year and cumulative energy savings values do not include the 3.55% savings from the Strategic Energy Management program, which is part of the Performance Based scorecard. This 3.55% savings are estimated to be 970,000 annual and 4,850,000 cumulative CCM savings.

[13] This calculation uses an average annual natural gas usage of 2,300 m^3 per year.

[14] This calculation uses cumulative savings, the federal carbon price, and the prescribed charge rate for marketable gas in Ontario.

[15] eTools is a digital Enbridge tool that leverages engineering calculations to estimate energy savings from boiler space and water heating projects.

1.1 Enbridge Scorecard Results

Table 1-1. Enbridge savings, spend, cost effectiveness, and incentive results*†

Program	Metric	Verified First-Year Savings (CCM)	Verified Cumulative Savings or Other Metric	Percent of Target Achieved	DSM Shareholder Incentive	OEB-Approved Program Budget	Utility Spending**	Budget/ Spending Variance	Benefit Cost Ratio (TRC Plus Test)***		Net Present Value (TRC Plus)***
									O&A Costs	No O&A Costs	
Resource Acquisition		**40,217,908**	**747,335,446**			**$42,908,517**	**$49,430,837**	**$6,522,320 (15%)**	**2.80**		**$156,479,000**
C&I Custom	CCM Savings	22,517,064	415,996,615	99.9%	$4,267,746	$7,658,968	$6,772,836	-$886,132	4.54	5.05	$95,405,000
C&I Direct Install	CCM Savings	2,501,800	31,979,551			$4,950,581	$2,909,245	-$2,041,337	3.41	3.64	$8,203,000
C&I Prescriptive	CCM Savings	3,278,116	38,277,606			$2,323,114	$2,438,956	$115,842	2.32	2.43	$7,563,000
Comprehensive Energy Management	CCM Savings	130,072	3,090,423			$98,838	$19,183	-$79,655	4.12	4.57	$646,000
Energy Leaders Initiative	CCM Savings	45,400	908,004			$0	$251,175	$251,175	0.85	0.87	-$46,000
Residential Adaptive Thermostats	CCM Savings	3,565,542	53,483,128			$2,262,870	$2,312,755	$49,885	3.17	3.32	$17,031,000
Run it Right	CCM Savings	44,885	224,426			$1,653,979	$225,192	-$1,428,787	0.21	0.21	-$259,000
Home Energy Conservation	CCM Savings	8,135,028	203,375,694			$18,727,200	$29,560,475	$10,833,275	1.66	1.71	$27,937,000
	Participants	N/A	15,321	152.4%					N/A	N/A	N/A
Resource Acquisition Overhead	N/A		N/A	N/A		$5,232,967	$4,941,020	-$291,947			
Low Income		**5,536,037**	**114,748,352**			**$13,849,850**	**$13,427,553**	**-$422,297 (-3%)**	**1.65**		**$14,707,000**
Home Winterproofing	CCM Savings	1,207,416	26,443,935	91.9%	$693,807	$6,736,859	$6,818,367	$81,508	1.55	1.65	$3,340,000
Multi-Residential	CCM Savings	4,328,621	88,304,418	95.1%		$3,967,353	$3,473,475	-$493,878	1.69	1.83	$11,368,000
New Construction	Applications	N/A	13	100.0%		$1,456,560	$1,540,866	$84,306	N/A	N/A	N/A
Low Income Overhead	N/A		N/A	N/A		$1,689,078	$1,594,845	-$94,233			
Market Transformation		**N/A**	**N/A**			**$7,181,118**	**$5,586,083**	**-$1,595,035 (-22%)**	**N/A**	**N/A**	**N/A**
School Energy Competition	Schools	N/A	0	0.0%	$0	$520,200	$0	-$520,200	N/A	N/A	N/A
Run it Right	Participants		36	31.0%		$329,209	$244,172	-$85,038			
Comprehensive Energy Management	Participants		2	3.6%		$941,562	$100,646	-$840,916			
Residential Savings by Design	Builders		24	62.5%		$3,392,296	$3,809,618	$417,322			
	Homes		2,514	81.0%							
Commercial Savings by Design	Developments		17	44.4%		$1,122,068	$604,724	-$517,344			
Market Transformation Overhead	N/A		N/A	N/A		$875,783	$826,923	-$48,860			
Enbridge Program Total		**45,753,945**	**862,083,798**		**$4,961,553**	**$63,939,485**	**$68,444,472**	**$4,504,987 (7%)**	**2.56**		**$171,187,000**
Portfolio Overhead and Administrative Costs						$3,817,891	$1,175,308	-$2,642,583 (-69%)			
Enbridge Portfolio Total						**$67,757,376**	**$69,619,780**	**-$1,862,404 (3%)**			

*Not all values may compute exactly due to rounding.
†CCM are cumulative cubic meters of natural gas.
**The OEB's DSM Framework allows for utility spending to differ from the approved budget. Sections 6.6 and 11.2 of the Filing Guidelines provide details for acceptable spending differences.
***Cost-effectiveness results use 2021 carbon tax rates that increase by $15 per year up to $170 per tCO2e in 2030. Beyond 2030, a 2% inflation rate is applied. Please see Appendix O for a more complete discussion of these costs as well as the application of O&A costs.

Table 1-2. Enbridge lost revenue results*

Rate Class	Verified Lost Revenue
Rate 110	$19,534
Rate 115	$2,495
Rate 135	$30,787
Rate 145	$3,786
Rate 170	$605
TOTAL	**$57,207**

*Not all values may compute exactly due to rounding.

1.2 Union Scorecard Results

Table 1-3. Union achievement, spend, cost effectiveness, and incentive results*†

Program	Metric	Verified First-Year Savings (CCM)	Verified Cumulative Savings or Other Metric	Percent of Target Achieved	DSM Shareholder Incentive	OEB-Approved Program Budget	Utility Spending**	Budget/ Spending Variance	Benefit Cost Ratio (TRC Plus Test)***		Net Present Value (TRC Plus)***
									O&A Costs	No O&A Costs	
Resource Acquisition		**35,457,931**	**635,084,369**			**$36,310,983**	**$31,447,736**	**-$4,863,247 (-13%)**	**1.82**		**$69,736,000**
C&I Custom	CCM Savings	26,753,925	470,976,925	82.6%	$806,921	$7,808,000	$9,244,820	$1,436,820	1.86	1.99	$44,711,000
C&I Direct Install	CCM Savings	1,362,569	18,403,367			$2,500,000	$1,897,957	-$602,043	2.74	2.90	$4,178,000
C&I Prescriptive	CCM Savings	2,102,246	30,179,867			$7,149,000	$2,264,922	-$4,884,078	2.32	2.44	$5,884,000
Residential Adaptive Thermostats	CCM Savings	1,545,557	23,183,355			$0	$1,177,701	$1,177,701	2.92	3.19	$7,015,000
Home Reno Rebate	CCM Savings	3,693,634	92,340,855			$12,226,000	$11,528,676	-$697,324	1.35	1.43	$7,948,000
	Participants	N/A	5,032	82.9%					N/A	N/A	N/A
Overhead and Administrative Costs	N/A		N/A	N/A		$6,627,983	$5,333,658	-$1,294,325			
Low Income		**2,965,806**	**63,747,123**			**$15,005,488**	**$11,966,434**	**-$3,039,054 (-20%)**	**1.66**		**$8,241,000**
Home Weatherization	CCM Savings	2,011,914	45,903,844	87.0%	$0	$8,374,000	$8,398,589	$24,589	1.83	1.99	$7,090,000
Furnace End-of-Life	CCM Savings	-	-			$917,000	$0	-$917,000	-	-	-
Indigenous	CCM Savings	-	-			$448,000	$71,444	-$376,556	0.00	0.00	-$70,000
Multi-Family - Social & Assisted	CCM Savings	507,004	9,535,480	54.7%		$3,573,000	$2,566,630	-$1,006,370	1.31	1.40	$1,222,000
Multi-Family - Market Rate	CCM Savings	446,888	8,307,799	69.5%							
Overhead and Administrative Costs	N/A	N/A	N/A	N/A		$1,693,488	$929,771	-$763,717	N/A	N/A	N/A
Large Volume		**9,712,370**	**141,733,709**			**$4,000,000**	**$2,729,314**	**-$1,270,686 (-32%)**	**5.23**		**$15,737,000**
Large Volume	CCM Savings	9,712,370	141,733,709	122.1%	$461,621	$3,150,000	$2,329,797	-$820,203	5.23	5.86	$15,737,000
Overhead and Administrative Costs	N/A	N/A	N/A	N/A		$850,000	$399,516	-$450,484	N/A	N/A	N/A
Market Transformation		**N/A**	**N/A**			**$2,338,070**	**$1,453,549**	**-$884,521 (-38%)**	**N/A**		**N/A**
Optimum Home	% of Homes Built	N/A	73.08%	120.0%	$200,960	$841,000	$63,077	-$777,923	N/A	N/A	N/A
Commercial New Construction	Developments		24	95.8%		$1,000,000	$816,326	-$183,674			
Overhead and Administrative Costs	N/A		N/A	N/A		$497,070	$574,146	$77,076			
Performance Based		**N/A**	**N/A**			**$1,053,000**	**$166,436**	**-$886,564 (-84%)**	**6.60**		**$848,000**
RunSmart	Participants	N/A	0	0.0%	$0	$163,000	$27,405	-$135,595	0.00	0.00	-$27,000
	% Savings		0.00%	0.0%							
Strategic Energy Management****	% Savings		3.55%	44.9%		$639,000	$86,438	-$552,563	8.06	13.99	$876,000
Overhead and Administrative Costs	N/A		N/A	N/A		$251,000	$52,593	-$198,407	N/A	N/A	N/A
Union Program Total		**48,136,107**	**840,565,201**		**$1,469,503**	**$58,707,541**	**$47,763,468**	**-$10,944,073 (-19%)**	**1.93**		**$94,562,000**
Portfolio Overhead and Administrative Costs						$5,642,000	$5,213,456	-$428,544 (-8%)			
Union Portfolio Total						**$64,349,541**	**$52,976,925**	**-$11,372,617 (-18%)**			

*Not all values may compute exactly due to rounding.
†CCM are cumulative cubic meters of natural gas.
**The OEB's DSM Framework allows for utility spending to differ from the approved budget. Sections 6.6 and 11.2 of the Filing Guidelines provide details for acceptable spending differences.
*** Cost-effectiveness results use 2021 carbon tax rates that increase by $15 per year up to $170 per tCO2e in 2030. Beyond 2030, a 2% inflation rate is applied. Please see Appendix O for a more complete discussion of these costs as well as the application of O&A costs.
**** The first-year and cumulative energy savings values do not include the 3.55% savings from the Strategic Energy Management program, which is part of the Performance Based scorecard. This 3.55% savings are estimated to be 970,000 annual and 4,850,000 cumulative CCM savings.

Table 1-4. Union lost revenue results*

Rate Class	Verified Lost Revenue
M4 Industrial	$89,768
M5 Industrial	$4,200
M7 Industrial	$31,007
T1 Industrial	$109
T2 Industrial	$1,042
20 Industrial	$1,142
100 Industrial	$5,948
TOTAL	**$133,216**

*Not all values may compute exactly due to rounding.

1.3 Report Structure

The table below provides an overview of the report structure and a link to each major section within the remainder of the report.

Section	Contents
2. Glossary of Key Terms and Concepts	This section contains a guide for readers to understand the terminology and concepts used throughout the report.
3. Introduction	This section provides the background of the annual verification report.
4. Scorecard: Resource Acquisition	• Scorecard achievements for Enbridge • Scorecard achievements for Union
5. Scorecard: Low Income	• Scorecard achievements for Enbridge • Scorecard achievements for Union
6. Scorecard: Large Volume	• Scorecard achievements for Union
7. Scorecard: Market Transformation	• Scorecard achievements for Enbridge • Scorecard achievements for Union
8. Scorecard: Performance Based	• Scorecard achievements for Union
9. Utility Summary of Shareholder Incentives, Program Spending, Cost Effectiveness, and Lost Revenue	• Enbridge Results • Union Results
10. Findings and Recommendations	Topics in this section include overall findings and recommendations, whole home simulation modelling, and cost effectiveness.
11. Appendices	• Evaluation Background • Metric Verification Activities • Changes from 2020 Evaluation • Summary of Verification Adjustments • Resource Acquisition Scorecards • Low Income Scorecards • Large Volume Scorecard • Market Transformation Scorecards • Performance Based (Union) and Market Transformation (Enbridge) Scorecards • Review of Metric Target Calculations • Review of Lost Revenue and DSM Shareholder Incentive Calculations • Lost Revenue and DSM Shareholder Incentive: Detailed Tables • Prescriptive Savings Verification • Program Spending Tables • Cost Effectiveness Methodology

2 GLOSSARY OF KEY TERMS AND CONCEPTS

Adjustment factor	An adjustment factor is a percentage or ratio that allows evaluation findings from a sample of projects to be applied to and "adjust" the population of projects. An example is an installation rate, which reflects the percentage of participants who installed a prescriptive measure and kept it installed.
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	The amount of gas used in the absence of a program offering. This could be the amount of gas the equipment in place is using, or the amount of gas that a standard efficiency piece of equipment would use.
Building envelope	Exterior surfaces of a building (for example walls, windows, roof, and floors) that separate the conditioned space from the outdoors.
C&I	Stands for commercial and industrial and can mean building types or customer types.
CCM	Cumulative cubic meters (cumulative m^3), and 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)	The process by which the cumulative gross savings estimates of the utilities' DSM projects are verified. A custom DSM project is based on customer-specific information and considerations, as opposed to standardized projects, which are called prescriptive.
Customer – Enbridge	Enbridge identifies unique customers based on the account number and the contact information. A customer may have multiple site addresses, decision makers, account numbers, and utilities. Customers can only be identified for records for which we received contact information.
Customer – Union	Union identifies unique customers based on the customer identification (ID) number and the contact information. A customer may have multiple site addresses, decision makers, customer IDs, and utilities. Customers can only be identified for records for which we received contact information.
Demand side management (DSM)	The act of modifying customer demand for gas through utility programs using various methods such as financial incentives (such as rebates), education, and outreach.
Domain	A grouping of like projects. For example, a domain may be defined as projects within a specific sector (such as residential homes), or it might be a category of measures (see definition in Glossary), end uses, or other categories.
Dual baseline	A phrase used to describe the baseline for a measure that replaces working equipment with high efficiency equipment, also known as early replacement. The first baseline is the energy used by the existing equipment and the second baseline is the energy used by a standard efficiency piece of equipment.

Early replacement (ER)	The act of replacing a piece of equipment that is not past its expected useful life (EUL) and is in good operating condition.
Early replacement period (ER Period)	Years that the existing equipment would have continued to be in use had it not been replaced early. This is the same as remaining useful life, or RUL.
Effective 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).
Energy advisors	People who work for utilities or their programs to provide information to customers about energy saving opportunities and program participation. This term includes, but is not limited to, Enbridge's Energy Solutions Consultants and Union's Account Managers.
Ex ante	This means "from before" in Latin. Program evaluators use this term to describe claimed or reported inputs, assumptions, savings, etc. for a measure (see definition in Glossary) or program.
Ex post	This means "from behind" in Latin. Program evaluators use this term to describe inputs, assumptions, savings, etc. that are assessed and verified after savings are reported or claimed. The term does not include assessment and verification of the amount of program influence (see free ridership) on inputs, assumptions, savings, etc. This term is sometimes used to mean verified gross savings.
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	Changes in energy consumption and/or demand from programs or projects included in utility programs, regardless of reasons for participation.
In situ	This means "on site" or "in position" in Latin. For verification of energy savings, this means the existing measure (see Glossary definition) conditions and/or efficiency.
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.
Incremental cost	The difference in purchase price (and any differences in related installation or implementation costs), at the time of purchase, between the energy-saving measure (see Glossary definition) and the base case measure. In some early retirements and retrofits, the full cost of the efficient technology is the incremental cost.
Industry standard practice (ISP)	A common practice used within an industry but not defined by code (see Glossary definition). For example, the agriculture sector is not covered by code, so the "typical" level of insulation used on hot water pipes is considered ISP.
Input assumptions	Operating characteristics and associated units of resource savings for DSM technologies and measures (see Glossary definition). These cover a range of typical DSM activities, measures, and technologies with residential, low-income, commercial and industrial applications.
Lifetime cumulative savings	These are total gas savings (in cumulative cubic meters, or CCM) over the life of a measure (see Glossary definition) and they are sometimes referred to as just "cumulative" or "lifetime" savings.

Maintenance (Maint.)	This is to repair, maintain, or restore to prior efficiency and/or optimum operation.
Measure	Equipment, technology, practice, or behavior that, once installed or working, results in a reduction in energy use.
Measure – Enbridge	For Enbridge, measures are identified in the tracking data as a unique combination of project ID and measure ID. Multiple measures may belong to the same project.
Measure – Union	For Union, measure refers to a project ID and line ID in the tracking data. 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)	The verification of energy 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 CCM 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	Means multifamily (multi-residential) and can be used to describe a building or program.
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.
Non-early replacement period (non-ER period)	The years after the ER period and up to the EUL.
Normal replacement (NR)	A measure that replaces a piece of equipment that has reached or is past its EUL and not in good operating condition.
Program	The OEB uses this term to categorize sub-units of Scorecards. For example, a program could be the C&I Custom Program within the Resource Acquisition Scorecard. DNV defines programs consistent with the OEB's Decision and Order approving the 2015-2020 DSM Plans.
Program evaluation	The activities related to the collection, analysis, and reporting of data for purposes of measuring program impacts (including gas savings and participation) from past, existing, or potential programs.
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 - Enbridge	For Enbridge, projects are identified in the tracking data based on the project ID. A project may have multiple measures as indicated by measure IDs in the current data tracking system.
Project – Union	For Union, projects are identified in the tracking data based on project ID. A project may have multiple measures as indicated by measure IDs in the current data tracking system.
Rate class	The OEB establishes distribution rate classes for Enbridge and Union. Distribution rate classes group customers with similar energy profiles.

Realization rate	This is the ratio of gross evaluated savings to gross claimed savings. This is used to provide a comparison of the savings that were achieved to the savings that were predicted.
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)	A measure that replaces a failed or failing piece of equipment.
Retrofit add-on (REA)	A measure that reduces energy use by modifying an existing piece of equipment.
Scorecard	A scorecard allows for multiple different kinds of metrics such as cumulative 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-2015-0029/EB-2015-0049.
Scorecard Achievement	The verified value for program-specific metric targets (CCM, 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 150%.
Site	Sites are places identified based on unique site addresses provided by Union and 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 contact information – i.e. records associated with account number (Enbridge) or customer ID (Union) that have projects in the sample or backup sample.
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)	To improve system or system settings to exceed prior efficiency.
TRM	Technical Resource Manual, which is a document that identifies standard methodologies and inputs for calculating energy savings.
TSER	This means telephone-supported engineering review. This is a method to support the verification of energy savings via telephone.
Unit of analysis – Enbridge	The level at which data are analyzed, which in 2021 is a "measure" or sub-project level for Enbridge.
Unit of analysis - Union	The level at which data are analyzed, which in 2021 is a project for Union. A project is equivalent to a measure for Union as the database did not have a sub-project level.
Vendors	Program trade allies, business partners, contractors, and suppliers who work with program participants to implement energy saving measures.

3 INTRODUCTION

Enbridge Gas Inc.[16] delivers demand-side management (DSM) programs[17] under the Demand Side Management Framework for Natural Gas Distributors (2015-2020[18] and extended through 2022[19]) developed by the Ontario Energy Board (OEB). The 2021 Natural Gas DSM Annual Verification Report has been prepared for the OEB to report the results of the annual verification of the utility's natural gas DSM programs delivered in 2021. These verifications were conducted by the OEB's Evaluation Contractor (EC) team of DNV and Dunsky.

As part of the utility DSM plan, 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 cumulative cubic meters (CCM) 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.

Each scorecard metric is assigned a target.[20] The EC uses sampling, engineering reviews, documentation verification, and other techniques to verify the utilities' performance against the target for each program year. The percentage of target achieved for each metric is combined across the scorecard and used to determine the amount the utility is eligible for as a demand-side management shareholder incentive (DSMSI).[21]

In addition to the shareholder incentive, the OEB compensates the utilities for the reduced revenue taken as a result of delivering these DSM programs, called "lost revenue", which is also verified by the EC.

The OEB requires the utilities to deliver DSM programs that are cost-effective, which means the verified benefits produced by the programs outweigh the cost of their implementation.[22] Cost effectiveness results can be found in Sections 9.1.3, 9.2.3, and 11.15.

The OEB formed an evaluation advisory committee (EAC) to provide input and advice to the OEB and the EC on the evaluation and audit of DSM results. The EAC consists of representatives from OEB staff, the utilities, non-utility stakeholders, independent experts, staff from the Independent Electricity System Operator (IESO), and an observer from the Ministry of Energy, Northern Development and Mines. The EC received feedback and input from the EAC on the results of this annual verification. The content included in this report integrates our responses to their input. We thank them for their involvement.

[16] Enbridge Gas Distribution Inc. (Enbridge) and Union Gas Limited (Union) amalgamated effective January 1, 2019 to become Enbridge Gas Inc. In 2021, Enbridge Gas Inc. delivered the two legacy utility DSM plans in its different rate zones – EGD rate zone and Union rate zones (North and South). For ease of reference, throughout this report, the EC has referred to the legacy utility DSM plans as Enbridge and Union.

[17] Throughout this report, the word "program" is used consistent with the OEB's 2015-2020 DSM Framework and Decision on the utilities' 2015-2020 DSM Plans. See Section 2 for additional detail.

[18] EB-2014-0134

[19] EB-2019-0271, OEB Decision and Order on 2021 DSM Plans, July 16, 2020
EB-2021-0002, OEB Decision and Order on 2022 DSM Plans, August 26, 2021

[20] These targets, which were set in part based on 2020 performance, are described in detail in Section 11.10.

[21] A minimum weighted scorecard achievement level of 75% is required to earn a portion of the available shareholder incentive for a scorecard.

[22] The cost-effectiveness methodology is described in detail in Section 11.15.

4 SCORECARD RESULTS: RESOURCE ACQUISITION

Programs within the Resource Acquisition scorecard provide customers with financial incentives that reduce the cost of upgrading to more energy efficient technologies and equipment. This scorecard comprises the largest share of both utilities' budgets and shareholder incentive.

4.1 Scorecard achievements for Enbridge

The metrics for the Enbridge Resource Acquisition scorecard include:

- Total cumulative large volume customer natural gas savings
- Total cumulative small volume customer natural gas savings
- Number of Home Energy Conservation program participants

A detailed explanation of the verification activities for all Resource Acquisition programs can be found in Section 11.5. Verified program achievements are listed in Table 4-1 with DSM shareholder incentive results in Table 4-2.

Table 4-1. Enbridge 2021 Resource Acquisition verified achievements*

Programs	Metrics	Verified Achievement	
		Program-level Achievements	Metric-level Achievements
Home Energy Conservation	Large Volume Customer - CCM	-	430,134,894
Residential Adaptive Thermostats		-	
C&I Custom		398,994,369	
C&I Direct Install		6,734,536	
C&I Prescriptive		20,068,154	
Comprehensive Energy Management		3,090,423	
Energy Leaders		908,004	
Run it Right		339,409	
Home Energy Conservation	Small Volume Customer - CCM	203,375,694	317,200,551
Residential Adaptive Thermostats		53,483,128	
C&I Custom		17,002,246	
C&I Direct Install		25,245,015	
C&I Prescriptive		18,209,452	
Comprehensive Energy Management		-	
Energy Leaders		-	
Run it Right		-114,983	
Home Energy Conservation	Participants	15,321	15,321

*Not all values may compute exactly due to rounding.

Table 4-2. Enbridge's 2021 Resource Acquisition targets, achievements, weights, and incentive*†

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
LV RA (CCM)	508,307,882	430,134,894	40.00%	84.62%	33.85%
SV RA (CCM)	239,149,677	317,200,551	40.00%	132.64%	53.05%
HEC Participants	10,054	15,321	20.00%	152.39%	30.48%
Verified Total Weighted Scorecard Achieved					117.38%
Maximum Scorecard Incentive					$7,012,787
Verified Scorecard Incentive Achieved					**$4,267,746**

*Not all values may compute exactly due to rounding.
†See Section 11.11 for a detailed description of the scorecard and incentive calculations.

Table 4-3 shows the net cumulative natural gas savings (CCM) by program, as verified by the EC. Unlike Table 4-1, this table shows overall program totals, not broken out by Large or Small Volume metrics.

Table 4-3. Enbridge's verified 2021 Resource Acquisition savings*

Program	Net Cumulative Savings (m3)
Home Energy Conservation	203,375,694
Residential Adaptive Thermostats	53,483,128
Commercial & Industrial Custom	415,996,615
Commercial & Industrial Direct Install	31,979,551
Commercial & Industrial Prescriptive	38,277,606
Comprehensive Energy Management	3,090,423
Energy Leaders	908,004
Run it Right	224,426
Resource Acquisition Total	**747,335,446**

*Not all values may compute exactly due to rounding.

4.2 Scorecard achievements for Union

This section summarizes the results of the EC's review of the Union Resource Acquisition scorecard. The metrics for the Union Resource Acquisition scorecard include:

- Total cumulative natural gas savings
- Number of Home Reno Rebate program participants

A detailed explanation of the verification activities for all Resource Acquisition programs can be found in Section 11.5. Verified program achievements are listed in Table 4-4 with DSM shareholder incentive results in Table 4-5.

Table 4-4. Union 2021 Resource Acquisition verified achievements*

Programs	Metrics	Verified Achievement	
		Program-level Achievements	Metric-level Achievements
Home Reno Rebate	CCM	92,340,855	635,084,369
Residential Adaptive Thermostats		23,183,355	
C&I Custom		470,976,925	
C&I Direct Install		18,403,367	
C&I Prescriptive		30,179,867	
Home Reno Rebate	Participants	5,032	5,032

*Not all values may compute exactly due to rounding.

Table 4-5. Union's 2021 Resource Acquisition targets, achievements, weights, and incentive*†

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
CCM	768,727,712	635,084,369	75.00%	82.61%	61.96%
HRR Participants	6,070	5,032	25.00%	82.89%	20.72%
Verified Total Weighted Scorecard Achieved					82.68%
Maximum Scorecard Incentive					$6,562,712
Verified Scorecard Incentive Achieved					**$806,921**

*Not all values may compute exactly due to rounding.
†See Section 11.11 for a detailed description of the scorecard and incentive calculations.

5 SCORECARD RESULTS: LOW INCOME

Programs within the Low Income scorecard provide eligible customers with opportunities to improve the energy efficiency of their homes (for residential customers) and buildings (for building owners and multifamily customers) at no cost.

5.1 Scorecard achievements for Enbridge

This section summarizes the results of the EC's review of the Enbridge Low Income scorecard. The metrics for the Enbridge Low Income scorecard include:

- Total cumulative natural gas savings for single family homes
- Total cumulative natural gas savings for multi-residential homes
- Total applications for Low Income New Construction

A detailed explanation of the verification activities for all Low Income programs can be found in Section 11.6. Verified program achievements are listed in Table 5-1 with DSM shareholder incentive results in Table 5-2.

Table 5-1. Enbridge 2021 Low Income verified achievements

Programs	Metrics	Verified Achievement	
		Program-level Achievements	Metric-level Achievements
Home Winterproofing	CCM	26,443,935	26,443,935
Low Income Multi-Residential	CCM	88,304,418	88,304,418
Low Income New Construction	Applications	13	13

Table 5-2. Enbridge's 2021 Low Income scorecard targets, achievements, weights, and incentive*†

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
Home Winterproofing CCM	28,769,589	26,443,935	45.00%	91.92%	41.36%
Low Income Multi Residential CCM	92,855,103	88,304,418	45.00%	95.10%	42.79%
Low Income New Construction Applications	13	13	10.00%	100.00%	10.00%
Verified Total Weighted Scorecard Achieved					94.16%
Maximum Scorecard Incentive					$2,263,561
Verified Scorecard Incentive Achieved					**$693,807**

*Not all values may compute exactly due to rounding.
†See Section 11.11 for a detailed description of the scorecard and incentive calculations.

5.2 Scorecard achievements for Union

This section summarizes the results of the EC's review of the Union Low Income scorecard. The metrics for the Union Low Income scorecard include:

- Total cumulative natural gas savings for single-family programs
- Total cumulative natural gas savings for "social & assisted" multifamily projects
- Total cumulative natural gas savings for "market rate" multifamily projects

A detailed explanation of the verification activities for all Low Income programs can be found in Section 11.6. Verified program achievements are listed in Table 5-3 with DSM shareholder incentive results in Table 5-4.

Table 5-3. Union 2021 Low Income verified achievements*

Programs	Metrics	Verified Achievement	
		Program-level Achievements	Metric-level Achievements
Home Weatherization	CCM	45,903,844	45,903,844
Furnace End-of-Life		-	
Indigenous		-	
Multi-Family Social & Assisted	CCM	9,535,480	9,535,480
Multi-Family Market Rate	CCM	8,307,799	8,307,799

*Not all values may compute exactly due to rounding.

Table 5-4. Union's 2021 Low Income targets, achievements, weights, and incentive*†

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
Single Family CCM	52,751,464	45,903,844	60.00%	87.02%	52.21%
Multi-Family - Social & Assisted CCM	17,447,511	9,535,480	35.00%	54.65%	19.13%
Multi-Family - Market Rate CCM	11,950,032	8,307,799	5.00%	69.52%	3.48%
Verified Total Weighted Scorecard Achieved					74.82%
Maximum Scorecard Incentive					$2,604,447
Verified Scorecard Incentive Achieved					**$0**

*Not all values may compute exactly due to rounding.
**A minimum total weighted scorecard achievement level of 75% is required to earn a portion of the available shareholder incentive.
†See Section 11.11 for a detailed description of the scorecard and incentive calculations.

6 SCORECARD RESULTS: LARGE VOLUME

Union's Large Volume Program comprises the entire Large Volume scorecard. This program provides large volume customers[23] with training presentations, energy efficiency calculation tools, energy use analysis, and other technical assistance from Union's Technical Account Managers. It uses a self-directed funding model in which eligible customers can access and utilize funds included in their natural gas rates. Funds from customers electing not to participate are dispersed to fund energy efficiency projects for participating Large Volume customers.

Enbridge did not have DSM programs specifically for their large volume customers in 2021.

6.1 Scorecard achievements for Union

This section summarizes the results of the EC's review of the Union Large Volume scorecard. The metric for the Large Volume scorecard is total cumulative natural gas savings. A detailed explanation of the verification activities for the Large Volume program, broken out by prescriptive and custom savings, can be found in Section 11.7. Verified program achievements are listed in Table 6-1 with DSM shareholder incentive results in Table 6-2.

Table 6-1. Union 2021 Large Volume verified achievements

Programs	Metrics	Verified Achievement	
		Program-level Achievements	Metric-level Achievements
Large Volume	CCM	141,733,709	141,733,709

Table 6-2. Union's 2021 Large Volume targets, achievements, weights, and incentive*†

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
CCM	116,103,299	141,733,709	100.00%	122.08%	122.08%
Verified Total Weighted Scorecard Achieved					122.08%
Maximum Scorecard Incentive					$694,265
Verified Scorecard Incentive Achieved					**$461,621**

*Not all values may compute exactly due to rounding.
†See Section 11.11 for a detailed description of the scorecard and incentive calculations.

[23] Large volume customers are those with very high natural gas consumption, typically large industrial and commercial facilities.

7 SCORECARD RESULTS: MARKET TRANSFORMATION

Programs within the Market Transformation scorecard focus on changing customer behavior and attitudes related to energy efficiency, intending to cause permanent change in the marketplace over time. Although energy savings may result from these programs, savings are typically not the primary goal.

7.1 Scorecard achievements for Enbridge

This section summarizes the results of the EC's review of the Enbridge Market Transformation scorecard. The metrics for the Enbridge Market Transformation scorecard include the number of:

- Builders for Residential Savings by Design
- Homes built for Residential Savings by Design
- New developments for Commercial Savings by Design
- Participating schools for School Energy Competition
- Participants for Run it Right
- Participants for Comprehensive Energy Management

As some programs are similar to Union Market Transformation programs, and others similar to Union Performance Based programs, the programs are divided between Section 11.8 (Market Transformation Scorecards) and Section 11.9 (Performance Based (Union) and Market Transformation (Enbridge) Scorecards), as listed in Table 7-1.

Table 7-1. Enbridge Market Transformation program detailed evaluation, by appendix

Enbridge Program	Appendix
Commercial Savings by Design	H
Residential Savings by Design	
School Energy Competition	
Run it Right	I
Comprehensive Energy Management	

Verified program achievements are listed in Table 7-2 with DSM shareholder incentive results in Table 7-3.

Table 7-2. Enbridge 2021 Market Transformation verified achievements

Programs	Metrics	Verified Achievement	
		Program-level Achievements	Metric-level Achievements
School Energy Competition	Schools	-	-
Run it Right	Participants	36	36
Comprehensive Energy Management	Participants	2	2
Residential Savings by Design	Builders	24	24
	Homes Built	2,514	2,514
Commercial Savings by Design	New Developments	17	17

Table 7-3. Enbridge's 2021 Market Transformation scorecard targets, achievements, weights, and incentive*†

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
School Energy Competition Schools	58	-	10.00%	0.00%	0.00%
Run it Right Participants	116	36	20.00%	31.03%	6.21%
Comprehensive Energy Management Participants	29	2	20.00%	3.57%	0.71%
Residential Savings by Design Builders	39	24	10.00%	62.50%	6.25%
Residential Savings by Design Homes	3,105	2,514	15.00%	80.96%	12.14%
Commercial Savings by Design Developments	37	17	25.00%	44.44%	11.11%
Verified Total Weighted Scorecard Achieved					36.43%
Maximum Scorecard Incentive					$1,173,652
Verified Scorecard Incentive Achieved					**$0**

*Not all values may compute exactly due to rounding.
**A minimum total weighted scorecard achievement level of 75% is required to earn a portion of the available shareholder incentive.
†See Section 11.11 for a detailed description of the scorecard and incentive calculations.

7.2 Scorecard achievements for Union

This section summarizes the results of the EC's review of the Union Market Transformation scorecard. The metrics for the Union Market Transformation scorecard include:

- Percentage of homes built by builders enrolled in the Optimum Home program
- Number of new developments enrolled by participating builders for Commercial New Construction

A detailed explanation of the verification activities for all Market Transformation programs can be found in Section 11.8. Verified program achievements are listed in Table 7-4 with DSM shareholder incentive results in Table 7-5.

Table 7-4. Union 2021 Market Transformation verified achievements

Programs	Metrics	Verified Achievement	
		Program-level Achievements	Metric-level Achievements
Optimum Home	Percentage of Homes Built	73.08%	73.08%
Commercial New Construction	New Developments	24	24

Table 7-5. Union's 2021 Market Transformation targets, achievements, weights, and incentive*†

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
Optimum Home Percentage of Homes Built	60.88%	73.08%	50.00%	120.03%	60.02%
Commercial New Construction Developments	25	24	50.00%	95.83%	47.92%
Verified Total Weighted Scorecard Achieved					107.93%
Maximum Scorecard Incentive					$405,810
Verified Scorecard Incentive Achieved					**$200,960**

*Not all values may compute exactly due to rounding.
†See Section 11.11 for a detailed description of the scorecard and incentive calculations.

8 SCORECARD RESULTS: PERFORMANCE BASED

Programs within the Performance Based scorecard focus on helping participating organizations make operational enhancements and improve their energy management practices. Although energy savings may result from these programs, savings are typically not the primary goal.

8.1 Scorecard achievements for Union

This section summarizes the results of the EC's review of the Union Performance Based scorecard. The metrics for the Union Performance Based scorecard include:

- Participants in the RunSmart program
- Percent savings achieved by participants in the RunSmart program
- Percent savings achieved by participants in the Strategic Energy Management program

A detailed explanation of the verification activities for all Performance programs can be found in Section 11.9. Verified program achievements are listed in Table 8-1 with DSM shareholder incentive results in Table 8-2.

Table 8-1. Union 2021 Performance Based verified achievements

Programs	Metrics	Verified Achievement	
		Program-level Achievements	Metric-level Achievements
RunSmart	Participants	-	-
	Savings %	0.00%	0.00%
Strategic Energy Management	Savings %	3.55%	3.55%

Table 8-2. Union's 2021 Performance Based targets, achievements, weights, and incentive*†

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
RunSmart Participants	69	-	10.00%	0.00%	0.00%
RunSmart Savings %	0.44%	0.00%	40.00%	0.00%	0.00%
Strategic Energy Management Savings %	7.87%	3.55%	50.00%	44.93%	22.46%
Verified Total Weighted Scorecard Achieved**					22.46%
Maximum Scorecard Incentive					$182,765
Verified Scorecard Incentive Achieved					**$0**

*Not all values may compute exactly due to rounding.
**A minimum total weighted scorecard achievement level of 75% is required to earn a portion of the available shareholder incentive.
†See Section 11.11 for a detailed description of the scorecard and incentive calculations.

9 UTILTY SUMMARY OF SHAREHOLDER INCENTIVES, PROGRAM SPENDING, COST EFFECTIVENESS, AND LOST REVENUE

This section provides the results of the financial performance of the 2021 DSM programs by utility.

9.1 Enbridge Results

9.1.1 Scorecard Weights and Shareholder Incentives

Table 9-1 shows Enbridge scorecard weights by metric and shareholder incentives by target for all programs. These were the metrics reviewed as part of the annual verification. The utility achieved a shareholder incentive of $4,961,553 or 47% of the maximum possible DSMSI incentive.

Table 9-1. Summary of Enbridge's 2021 achievement weights and shareholder incentives

Scorecard	Program	Metric	Weight	Utility Incentive
Resource Acquisition	Home Energy Conservation Residential Adaptive Thermostats C&I Custom C&I Direct Install C&I Prescriptive Comprehensive Energy Management Run it Right	Large Volume (CCM)	40.0%	$4,267,746
		Small Volume (CCM)	40.0%	
	Home Energy Conservation	Participants	20.0%	
Low Income	Home Winterproofing	CCM	45.0%	$693,807
	Low Income Multi-Residential	CCM	45.0%	
	Low Income New Construction	Applications	10.0%	
Market Transformation	School Energy Competition	Schools	10.0%	$0
	Run it Right	Participants	20.0%	
	Comprehensive Energy Management	Participants	20.0%	
	Residential Savings by Design	Builders	10.0%	
		Homes	15.0%	
	Commercial Savings by Design	Developments	25.0%	
Total Verified Utility Incentive				**$4,961,553**
Incentive if 100% of target achieved				$4,180,000
Maximum possible incentive (if 150% of target achieved)				$10,450,000

*Not all values may compute exactly due to rounding.

9.1.2 Program Spending Summary

The Enbridge tracking database included reported program spending information. The EC has reported on what was provided by Enbridge but has not verified spending figures or conducted a financial audit. Table 9-2 summarizes the spending across the portfolio. Additional spending detail is in Section 11.14.

Table 9-2. Enbridge program cost summary*

Spending Area	OEB-Approved Budget	Utility Spending	Difference ($)	Difference (%)
Program Sub-total (no overhead)	$56,141,657	$61,081,684	$4,940,027	9%
Program Overhead	$7,797,828	$7,362,788	-$435,040	-6%
Process and Program Evaluation	$1,774,228	$518,568	-$1,255,660	-71%
Other**	$2,043,663	$656,740	-$1,386,923	-68%
Total DSM Budget	**$67,757,376**	**$69,619,780**	**$1,862,404**	**3%**

*Not all values may compute exactly due to rounding.
**Other includes DSM IT Chargeback (no utility spending in 2021) and Collaboration and Innovation.

9.1.3 Cost Effectiveness Summary[24]

Table 9-3 and Table 9-4 show summary results for the TRC-Plus and PAC tests, respectively, including the benefit cost ratio and the net present value.[25,26] The EC cost effectiveness methodology applied in 2021 is consistent with what was done for the 2020 analysis. Additional detail, including the key inputs used in the TRC-Plus and PAC tests, is provided in Section 11.15.

Table 9-3. Enbridge summary of cost-effectiveness ratio results, TRC-Plus Test*

Scorecard	NPV Benefits	NPV Costs	NPV Net Benefits (Benefits – Cost)	TRC-Plus Benefit Cost Ratio
Resource Acquisition	$243,593,000	$87,114,000	$156,242,000	2.80
Low Income	$37,202,000	$22,495,000	$14,707,000	1.65
Total	**$280,795,000**	**$109,609,000**	**$171,187,000**	**2.56**

*Not all values may compute exactly due to rounding.

Table 9-4. Enbridge summary of cost effectiveness ratio results, PAC Test*

Scorecard	NPV Benefits	NPV Costs	NPV Net Benefits (Benefits – Cost)	PAC Benefit Cost Ratio
Resource Acquisition	$207,210,000	$49,776,000	$157,435,000	4.16
Low Income	$32,603,000	$11,887,000	$20,716,000	2.74
Total	**$239,813,000**	**$61,662,000**	**$178,151,000**	**3.89**

*Not all values may compute exactly due to rounding.

[24] Cost effectiveness results for the 2021 programs do not reflect the significant gas price increases occurring in 2022.

[25] Unlike Table 1-1 in the Executive Summary or the Enbridge-specific tables in Section 11.15, these tables do not include alternative benefit cost ratios that do not apportion the portfolio-level overhead and administration costs. The alternative ratios are only computed at the OEB-defined individual program level, and not the scorecard or overall portfolio level.

[26] The cost-effectiveness results are based on 2021 carbon tax rates.

9.1.4 Lost Revenue by Rate Class

The EC summed the verified net annual savings (prorated by installation month) by rate class and estimated lost revenues. Table 9-5 shows the results for each rate class.

Table 9-5. Enbridge lost revenue results*

Rate Class	Verified Lost Revenue
Rate 110	$19,534
Rate 115	$2,495
Rate 135	$30,787
Rate 145	$3,786
Rate 170	$605
TOTAL	**$57,207**

*Not all values may compute exactly due to rounding.

9.2 Union Results

9.2.1 Scorecard Weights and Shareholder Incentives

Table 9-6 shows the Union scorecard weights by metric and shareholder incentives by target for all programs. These were the metrics reviewed as part of the annual verification. The utility achieved a shareholder incentive of $1,469,503 or 14% of the maximum possible DSMSI incentive.

Table 9-6. Summary of Union's 2021 achievement weights and shareholder incentives*

Scorecard	Program	Metric	Weight	Utility Incentive
Resource Acquisition	C&I Custom C&I Direct Install C&I Prescriptive Home Reno Rebate Residential Adaptive Thermostats	CCM	75.0%	$806,921
	Home Reno Rebate	Participants	25.0%	
Low Income	Indigenous Furnace End-of-Life Home Weatherization	CCM	60.0%	$0
	Multi-Family (Social & Assisted)	CCM	35.0%	
	Multi-Family (Market Rate)	CCM	5.0%	
Large Volume	Large Volume	CCM	100.0%	$461,621
Market Transformation	Optimum Home	% of Homes Built	50.0%	$200,960
	Commercial New Construction	Developments	50.0%	
Performance-Based	RunSmart	Participants	10.0%	$0
		Savings %	40.0%	
	Strategic Energy Management	Savings %	50.0%	
Total Verified Utility Incentive				**$1,469,503**
Incentive if 100% of target achieved				$4,180,000
Maximum possible incentive (if 150% of target achieved)				$10,450,000

*Not all values may compute exactly due to rounding.

9.2.2 Program Spending Summary

Union's tracking database included program spending by scorecard. The EC has reported on what was provided by Union and has not verified spending figures or conducted a financial audit. Table 9-7 shows the Union budget for the portfolio overall. Additional spending detail is in Section 11.14.

Table 9-7. Union program cost summary*

Spending Area	OEB-Approved Budget	Utility Spending	Difference ($)	Difference (%)
Programs Sub-total (no overhead)	$48,788,000	$40,473,784	-$8,314,216	-17%
Program Overhead	$9,919,541	$7,289,684	-$2,629,857	-27%
Research	$1,000,000	$1,010,783	$10,783	1%
Evaluation	$1,300,000	$347,084	-$952,916	-73%
Administration	$2,842,000	$3,442,573	$600,573	21%
Other**	$500,000	$413,017	-$86,983	-17%
Total DSM Budget	**$64,349,541**	**$52,976,925**	**-$11,372,617**	**-18%**

*Not all values may compute exactly due to rounding.
**Other includes pilot programs and Open Bill Project.

9.2.3 Cost Effectiveness Summary[27]

Table 9-8 and Table 9-9 show summary results for the TRC-Plus and PAC tests, respectively, including the benefit cost ratio and net present value.[28,29] The EC cost effectiveness methodology applied in 2021 is consistent with what was done for the 2020 analysis. Additional detail, including the key inputs used in the TRC-Plus and PAC tests, is shown in Section 11.15.

Table 9-8. Union summary of cost-effectiveness ratio results, TRC-Plus Test*

Scorecard	NPV Benefits	NPV Costs	NPV Net Benefits (Benefits – Cost)	TRC-Plus Benefit Cost Ratio
Resource Acquisition	$154,842,000	$85,106,000	$69,736,000	1.82
Low Income	$20,776,000	$12,535,000	$8,241,000	1.66
Large Volume	$19,454,000	$3,717,000	$15,737,000	5.23
Performance Based	$1,000,000	$151,000	$848,000	6.60
Total	**$196,072,000**	**$101,509,000**	**$94,562,000**	**1.93**

*Not all values may compute exactly due to rounding.

[27] Cost effectiveness results for the 2021 programs do not reflect the significant gas price increases occurring in 2022.

[28] Unlike Table 1-3 in the Executive Summary or the Union-specific tables in Section 11.15, these tables do not include alternative benefit cost ratios that do not apportion the portfolio-level overhead and administration costs. The alternative ratios are only computed at the OEB-defined individual program level, and not the scorecard or overall portfolio level.

[29] The cost-effectiveness results are based on 2021 carbon tax rates.

Table 9-9. Union summary of cost effectiveness ratio results, PAC Test*

Scorecard	NPV Benefits	NPV Costs	NPV Net Benefits (Benefits – Cost)	PAC Benefit Cost Ratio
Resource Acquisition	$134,662,000	$31,448,000	$103,214,000	4.28
Low Income	$18,257,000	$11,966,000	$6,290,000	1.53
Large Volume	$16,386,000	$2,729,000	$13,657,000	6.00
Performance Based	$913,000	$166,000	$747,000	5.49
Total	**$170,218,000**	**$46,309,000**	**123,908,000**	**3.68**

*Not all values may compute exactly due to rounding.

9.2.4 Lost Revenue by Rate Class

The EC summed the verified net annual savings (prorated by installation month) by rate class and estimated lost revenues. Table 9-10 shows the results.

Table 9-10. Union lost revenue results*

Rate Class	Verified Lost Revenue
M4 Industrial	$89,768
M5 Industrial	$4,200
M7 Industrial	$31,007
T1 Industrial	$109
T2 Industrial	$1,042
20 Industrial	$1,142
100 Industrial	$5,948
TOTAL	**$133,216**

*Not all values may compute exactly due to rounding.

10 FINDINGS AND RECOMMENDATIONS

This section contains the findings and recommendations from all studies completed by the EC on the 2021 programs and recommendations from the previous annual verification report that are still relevant and remain outstanding, are in progress, or have been completed.

For 2021, recommendations relate only to the annual verification as no other studies were completed this year at the time or publishing. As noted in the EC's EM&V Plan, there is also an ongoing verification of eTools, a digital Enbridge tool that leverages engineering calculations to estimate energy savings from boiler space and water heating projects. The EC is currently conducting the study comparing the eTools savings estimates with those estimated by modelling site-level energy usage from customer bills, a methodology that leverages actual natural gas data. As this study was ongoing at the time this report was published, the EC did not provide any conclusions from that investigation in this report.

The 2021 annual verification identified several recommendations, most of which were previously identified in annual verification processes. The relative lack of new findings and recommendations is representative of a mature set of programs and a well-developed evaluation process. Compared to earlier evaluation years within this DSM Framework, the EC now encounters few issues, surprises, or gaps in data. This is a result of Enbridge responding effectively to previous recommendations and their willingness to proactively engage in the evaluation process.

Table 10-1, Table 10-2, and Table 10-3 show the findings and recommendations applying to the annual verification overall, whole home simulation modelling, and cost effectiveness, respectively. In the tables, primary outcomes of each finding and recommendation are classified into three categories: reduce costs (evaluation or program or both), improve savings accuracy, and decrease risk (multiple types of risk are in this category including risk of adjusted savings, risk to budgets or project schedules, and others). Further details follow the tables.

Table 10-1. Overall annual verification - summary of recommendations

#	Status	Finding	Recommendation	Previously Recommended	Applies to 2021		Primary Outcome		
					Utility	OEB	Reduce Costs	Improve Accuracy	Decrease Risk
O1	In Progress	Explicit third-party documentation was available for some, but not all, program qualification and participation requirements for all programs.	A: Third-party documentation for each required element for all non-savings metrics should be collected, requested, and delivered.	✓	✓		✓	✓	✓
O2	In Progress	Neither Union nor Enbridge tracking databases currently use prescriptive measure descriptions that map directly to the approved energy savings spreadsheet (TRM).	A: Develop, maintain, and use an electronic summary spreadsheet of the TRM.	✓		✓	✓	✓	✓
			B: Once the electronic TRM spreadsheet is developed, track prescriptive savings using unique measure	✓	✓		✓	✓	✓

			descriptions that map to electronic TRM.						
			C: Once the electronic TRM spreadsheet is developed, utilize the same electronic TRM for both utilities.	✓	✓		✓	✓	✓
			D: Develop means for consistent system.	✓		✓	✓	✓	✓
O3	In Progress	In recent years, evaluation results have stabilized and there have been only small changes to the annual verification activities or results.	A: In the next EM&V plan, consider shifting evaluation resources and attention towards areas that have historically received less rigorous focus but may have a higher risk of inaccurate verification.			✓		✓	✓

Table 10-2. Whole home simulation modelling - summary of recommendations

#	Status	Finding	Recommendation	Previously Recommended	Applies to 2021		Primary Outcome		
					Utility	OEB	Reduce Costs	Improve Accuracy	Decrease Risk
SM1	In Progress	The energy savings from the home retrofit programs rely exclusively on the simulations provided by the delivery agents.	A: Should the program continue to use current modelling software, consider funding a study to verify the models produced by the utility agents.	✓		✓		✓	
SM2	In Progress	Air sealing as a savings measure is present in a high percentage of single-family home retrofit projects.	A: For all whole home programs, provide the EC with air sealing percent improvement and energy savings attributable to air sealing.	✓	✓			✓	✓

Table 10-3. Cost-effectiveness - summary of recommendations

#	Status	Finding	Recommendation	Previously Recommended	Applies to 2021		Primary Outcome		
					Utility	OEB	Reduce Costs	Improve Accuracy	Decrease Risk
CE1	In Progress	All overhead is still applied at the sector level rather than the program level.	A: Allocate "sector"-level administrative cost and overhead to each individual program.	✓	✓	✓		✓	✓
CE2	In Progress	Methodology changes to the calculation of carbon benefits were made due to a federal regulatory update; however, this change was communicated late in the AV process.	A: Increase transparency when changes are made to accepted methodology.		✓			✓	✓
CE3	Completed	Methodologies for calculating incremental cost of dual baseline measures now align when comparing the EC's and Enbridge's calculations	A: Increase transparency in how incremental costs of dual baseline measures are calculated.	✓	✓			✓	

10.1.1 Overall Annual Verification Recommendations

O1. Finding: Explicit documentation (ideally, from a third-party) was not available for all program qualification and participation requirements for all programs. For example, the EC found the following:

- Union's Optimum Home program has a metric of percent of homes built, which is a function of the number of Optimum Homes built and the total number of natural gas housing starts for each builder in the calendar year. Enbridge provided the total number of natural gas housing starts in an Excel file created by Enbridge, but no independent proof to support the requirement.

Recommendation A: Third-party documentation for each required element for all non-savings metrics should be collected, requested, and delivered to the EC to prove program qualification and participation.

Previously Recommended: Yes – since the 2016 AV report.

Outcome: Reduced burden on utility staff and reduced evaluation costs.

Utility Response: As noted in the utility response to this recommendation in the 2020 verification report, the data on total number of natural gas housing starts does not come from a third party. It is output generated directly into Excel from an internal Enbridge database. No meaningful screenshot of the data within the database is possible. The EC should clarify what additional steps can be taken to address this recommendation.

EC Response: The EC considers this recommendation as in-progress, as it failed to follow up with Enbridge regarding additional supporting documentation for the Optimum Home program in the 2021 verification. The EC will pursue this recommendation further in the 2022 verification.

O2. Finding: Both Union and Enbridge tracking databases currently use prescriptive measure descriptions that map directly to *internally* consistent measure names. However, there is not a universally accessible (i.e., public) dataset that is fully transparent and comprehensive for all prescriptive and quasi-prescriptive measures. While the Technical Resource Manual (TRM) provides full documentation for new or updated measures; it does not provide a comprehensive resource for all currently accepted measures nor does it provide a concise location for all items that can impact gross or net savings such as detailed accounting of free ridership.

Recommendation A: Develop, maintain, and use an electronic summary of the TRM, such as an Excel file. Each measure (identified as a unique savings value) should have an assigned measure ID number, and new ID numbers should be assigned when a measure is updated with a new savings value. This allows for a historical record of the changes in the TRM and allows the evaluation to identify outdated values. For simplification and transparency, this system should be utilized for both utilities.

Recommendation B: Once the electronic TRM is developed, track prescriptive savings using unique measure descriptions that clearly map to the electronic TRM.

Recommendation C: Once the electronic TRM is developed, utilize the same electronic summary file for both utilities.

Recommendation D: As the entity with primary ownership of the TRM, the OEB should develop the references for parties to directly refer to specific measures in a consistent way which accounts for variations in energy savings due to capacity or other characteristics.

Previously Recommended: Yes – since the 2015 AV Report.

Outcome: Reduced burden on utility staff and reduced evaluation costs. Fewer errors in the tracking data.

Utility Response: As noted in Recommendation D, the OEB has primary ownership of the TRM including the development of a complete electronic TRM and unique measure IDs. Enbridge proposes that Board Staff address the EC's finding but that Enbridge needs to be involved to ensure the electronic TRM is developed in a manner that is functional within Enbridge tracking systems. Enbridge also notes its understanding that there were no errors in the 2021 natural gas savings tracking data for prescriptive measures in its portfolio.

OEB Response: As noted in its response to this recommendation in the 2020 AV Report, the OEB supports this recommendation and gave DNV direction to immediately develop the suggested electronic summary of the TRM for implementation as part of the 2021 program evaluation process. The OEB expects that the electronic TRM will be incorporated into future evaluation efforts following the 2021 evaluation process.

EC Response: The EC considers this recommendation as in-progress, as it has developed a beta version of this electronic TRM (eTRM) resource. Pending preliminary testing and confirmation of this beta version on the 2021 program data (which was ongoing at the time this report was published), the EC plans to fully implement the eTRM into its verification process in the next evaluation year.

O3. Finding: Over the course of the current DSM Framework and EM&V Plans, the evaluation results have stabilized and there have been only small changes to the annual verification activities or results in recent years. Assuming the new DSM Framework is based on the current programs and will not entail a wholesale change to program structure or make-up, this stability in evaluation is likely to continue. This presents an opportunity in the next EM&V planning process to construct a more rigorous evaluation of metrics that do not currently, but could, entail more third-party verification of participation and project details. This potential evaluation change would likely focus on non-savings metrics.

Recommendation A: In the next EM&V plan, consider shifting evaluation resources and attention away from well-developed areas with relatively low risk of systematic errors (like prescriptive savings verification) towards those that have historically received less rigorous focus but may have a higher risk of inaccurate verification (like participation-type metrics).

Previously Recommended: No.

Outcome: Greater certainty of metric achievements. Decreased risk of inaccurate verification of non-savings metrics.

Utility Response: As noted in Table 10-1, this recommendation is directed to the OEB.

OEB Response: The OEB supports this recommendation and will consider how to best incorporate into its next EM&V plan following the OEB's Decision and Order regarding Enbridge's proposed multi-year DSM plan application for 2023 and beyond.

EC Response: This is a new recommendation. The EC looks forward to working with the OEB to incorporate this potential change in the next evaluation year.

10.1.2 Whole Home Simulation Modelling Recommendations

SM1. Finding: The energy savings from the home retrofit programs rely exclusively on the simulations provided by the delivery agents. Those simulations likely rely on a number of assumptions or standard modelling practices which may or may not follow industry standards. Although these assumptions and practices may follow NRCan protocols, those protocols were not specifically designed for the delivery of a DSM program and may not be appropriate in this situation. A detailed review of the models was outside the scope of the annual audit.

Recommendation A: Consider funding a study to verify the models produced by the utility agents to ensure they conform to standard industry practice.

Previously Recommended: Yes – since the 2015 AV report.

Outcome: Greater certainty around savings estimates.

Utility Response: As noted in Table 10-2, this recommendation is directed to the OEB. For clarity, HOT2000 is the modelling software within Enbridge's OEB-approved DSM Plans for use in whole home modelling offerings.[30] The residential Home Efficiency Rebate offerings are delivered by registered Energy Advisors affiliated with NRCan-licensed Service Organizations, with the expectation that NRCan HOT2000 protocols/standards are being followed given that this is a licencing requirement. Failure to follow these protocols/standards could result in suspension or loss of licence by NRCan, which would in turn render Energy Advisors ineligible to participate in Enbridge's program.

OEB Response: The OEB supports this recommendation and has indicated its interest in completing this study pending direction related to the future of Enbridge's residential home retrofit program. Based on the OEB's Decision and Order regarding Enbridge's proposed multi-year DSM plan application for 2023 and beyond, OEB will determine the appropriate timing and scope of any study of the residential program once there is greater clarity and certainty of the program's future.

EC Response: The EC considers this recommendation as on-hold. Should the residential home retrofit program be approved to continue and use the same or similar modelling software, the EC's recommendation stands. It is important to verify that the Energy Advisors using the modelling software are doing so consistently with industry best practice for natural gas efficiency programs.

SM2. **Finding:** Air sealing as a savings measure is present in a high percentage of single-family home retrofits (over 95% of homes in some programs). With such a high percentage of projects relying on a single measure type, particularly one with such wide variance in savings per household, it is important to ensure the savings validity of that measure. Enbridge has provided air sealing percent improvement for each household for the Home Energy Conservation and Home Reno Rebate programs, but not the Low Income whole home programs (Home Winterproofing and Home Weatherization). Further, the energy savings attributable to air sealing for each household has not been provided.

Recommendation A: If possible, Enbridge should provide the EC with air sealing percent improvement and energy savings attributable to air sealing for each household participating in all whole home programs. This could potentially be accomplished by having the energy advisors implementing the programs run the simulations with and without the air sealing measure.

Previously Recommended: Yes – since the 2016 AV report.

Outcome: Greater certainty around savings estimates.

Utility Response: Enbridge notes the EC's observation of air sealing (also known as draft proofing) being a measure in a high percentage of single-family home retrofits refers to HER and not HWP.

Eligibility in Enbridge's whole home residential HER offerings requires installation of a certain number of "major" measures. For example, to count draft proofing as a major measure, air changes per hour ("ACH") data needed to calculate air sealing percent improvement must be collected for comparison against a measure eligibility threshold.

[30] See for example EB-2015-0029, 2015-2020 DSM Plan Union Gas Limited, Exhibit A Tab 2 Page 13 of 38

Since ACH values are collected for HER, Enbridge will continue to provide the EC with these values and air sealing percentage improvements for all HER participants as it has done in the 2021 verification cycle.

Enbridge's low-income HWP offerings involve the direct install of whole home upgrades that can reasonably be done in a home while keeping above a TRC ratio of 0.7 for the low-income program. There are no requirements that any specific upgrade, such as draft proofing, needs to hit a certain eligibility threshold. As such, ACH values are not extracted from the HOT2000 simulation files and air sealing percent improvement is not calculated or tracked for HWP participants. However, Enbridge does note that ACH values can be found in the sample of HWP simulation files it provides each year to the EC. Air sealing percent improvement can be calculated from those values.

Currently, HWP ACH data can only be extracted manually. There are thousands of homes claimed through the HWP offerings and this manual extraction would be resource intensive. Considering the resources required, Enbridge would like to better understand the need to manually collect ACH values for homes participating the HWP offerings since this data is not needed to assess HWP eligibility, calculate whole home energy savings or compare offering results to scorecard metrics.

As the EC noted in its response to this recommendation in the 2020 verification report, providing energy savings attributed to air sealing (draft proofing) for each household participating in HER and HWP whole home programs would require energy advisors to run HOT2000 simulations both with and without the air sealing measure. This would be complicated to conduct in field and be resource intensive. It would also require storing additional simulation files, extracting twice the data and maintaining this information in our tracking systems. Considering the resources required, Enbridge would like to better understand the need to conduct these additional steps since the data is not needed to assess eligibility, calculate whole home energy savings, or compare offering results to scorecard metrics.

EC Response: The EC considers this recommendation as in-progress. Enbridge is correct that collecting the above-referenced data is not currently required within the DSM framework. However, since air sealing is a crucial component of the whole home programs (as outlined above), it may be a candidate for further examination in the future. The EC will work with the OEB and Enbridge to identify what additional steps should be taken.

10.1.3 Cost Effectiveness Recommendations

CE1. Finding: For 2021, like previous years, administrative and overhead costs are allocated differently by each legacy utility. For example, legacy Union Gas identifies administration and evaluation costs at the scorecard level whereas Enbridge details spending as direct and indirect at the OEB-defined program level and then has an explicit 'overhead' spend at the scorecard level. Differences between each legacy utility's rate zones and how cost effectiveness is reported reflects the approved DSM plans developed in 2015 by separate organizations. In the absence of clear alignment of administrative and overhead costs, the EC apportioned Enbridge 'overhead' costs based on the distribution of savings. In 2019, Enbridge and OEB agreed that it is not appropriate to make fundamental changes in the middle of the DSM Framework, and full alignment should occur as part of the next DSM Framework and Plan.

Recommendation A: Under the next framework, Enbridge and the OEB should agree on a plan that calculates cost effectiveness at the appropriate level, allocates administrative costs and overhead to each component at the appropriate level, and ensures that cost-effectiveness results properly reflect true program costs and benefits.

Previously Recommended: Yes – since the 2015 AV Report.

Outcome: Ensure all costs are properly accounted for and allocated at the appropriate level so cost effectiveness results better reflect the true program costs.

EC Response: Enbridge Gas agrees with the EC that this issue is best dealt with via OEB Decision on Enbridge's multi-year DSM plan application for 2023 and beyond where full alignment between rate zones ought to occur.

OEB Response: As noted in its response to this recommendation in the 2020 AV Report, the OEB generally supports this recommendation. In particular, the OEB supports consistency in how costs are reported and ensuring accuracy of the cost effectiveness calculations. The ultimate decision on how this will be administered in the future will be determined by the panel of OEB Commissioners deciding on Enbridge's multi-year DSM plan application for 2023 and beyond.

EC Response: The EC considers this recommendation as in-progress as the 2022-2027 DSM Framework and Plan have not been formally approved.

CE2. **Finding**: Enbridge instituted two changes to the methodology to calculate the cost of carbon in 2021, one of which reflects the number of participants subject to the carbon charge and one of which reflects the magnitude of the charge. In the 2020 verification, all natural gas savings provided the same carbon benefits per CCM saved, whereas for 2021, Enbridge applied a weighting factor to reflect the proportion of customers within a rate class which are subject to the carbon charge. Also in the 2020 verification, the cost of carbon was defined by the Greenhouse Gas Pollution Pricing Act whereas for 2021, Enbridge adjusted the carbon charge per a December 2020 federal regulatory update, which established annual carbon pricing increases of $15/tonne from 2023 to 2030. Beyond 2030, a 2% inflation rate for remaining years (i.e., year 20 to 30) was applied. Typically, fundamental changes in the middle of the DSM Framework are not deemed appropriate (e.g., see CE1 above); however, the impact of applying the weightings to account for fully and partially exempt customers and volumes is material. The EC was directed to make these changes by the OEB during the cost effectiveness verification activities to accurately reflect the impact of carbon pricing in TRC calculations. Enbridge is encouraged to communicate to the EC when methodological changes such as this occur during the DSM Framework.

Recommendation A: Increase transparency and communication when changes are made to accepted methodology.

Previously Recommended: No.

Outcome: Ensure consistent methodology to assess cost effectiveness and increase efficiency of the evaluation.

Utility Response: At the launch of the annual verification cycle in April 2022, Enbridge provided the EC with the information needed to calculate avoided carbon costs using the updated methodology and a note highlighting the change. Moving forward, Enbridge will attempt to identify similar changes to accepted methodology more clearly.

EC Response: This is a new recommendation. The EC will continue to work with Enbridge to ensure effective communication when methodological changes are made.

CE3. **Finding**: In the past, it was not clear how Enbridge calculated incremental costs regarding dual baseline measures. Calculating the incremental cost for dual baseline measures is more involved than for replace on burnout measures, and the EC's and Enbridge's calculations often resulted in slightly different values. For the 2021 verification, the EC's and Enbridge's calculation of incremental costs resulted in the exact same cost effectiveness values, indicating alignment on methodology. As a result, this recommendation from the previous report has been completed.

Recommendation A: Increase transparency in how incremental costs of dual baseline measures are calculated.

Previously Recommended: Yes – since the 2020 AV Report.

Outcome: Ensure accurate cost effectiveness results.

Utility Response: Enbridge will continue with the aligned dual baseline methodology used in the 2021 verification.

EC Response: This recommendation from the previous report has been completed.

11 APPENDICES

11.1 Appendix A: Evaluation Background

Enbridge and Union deliver energy efficiency programs under the Demand Side Management Framework for Natural Gas Distributors (2015-2020 and extended through 2022) developed by the OEB. For the 2015 program year, both utilities "rolled-over" their 2014 plans into 2015 to allow them a smooth evolution into the new DSM framework. For the 2016 program year (and continuing through 2021), the new framework was implemented, resulting in changes to the programs offered, as shown in Table 11-1. Programs included in the plan and offered by the utilities are marked with a check, those in the plan and offered by the utilities but with no activity reported are marked with an X.

Table 11-1. DSM programs offered – 2015 through 2021

Scorecard	Program Name	2015	2016	2017	2018	2019	2020	2021
Enbridge								
Resource Acquisition	C&I Custom	✓	✓	✓	✓	✓	✓	✓
	C&I Direct Install		✓	✓	✓	✓	✓	✓
	C&I Prescriptive	✓	✓	✓	✓	✓	✓	✓
	Comprehensive Energy Management		✗	✗	✗	✗	✓	✓
	Energy Leaders Initiative		✓	✓	✓			✓
	Home Energy Conservation	✓	✓	✓	✓	✓	✓	✓
	Residential Adaptive Thermostats		✓	✓	✓	✓	✓	✓
	Run it Right (CCM)	✓	✓	✓	✓	✓	✓	✓
	Small Commercial New Construction		✗	✗	✗			
Low Income	Low Income Multi-Residential	✓	✓	✓	✓	✓	✓	✓
	Low Income New Construction	✓	✓	✓	✓	✓	✓	✓
	Home Winterproofing		✓	✓	✓	✓	✓	✓
Market Transformation	Commercial Savings by Design	✓	✓	✓	✓	✓	✓	✓
	Residential Savings by Design	✓	✓	✓	✓	✓	✓	✓
	School Energy Competition	✓	✓	✓	✓	✓	✓	✗
	Run it Right (Participants)		✓	✓	✓	✓	✓	✓
	Comprehensive Energy Management		✓	✓	✓	✓	✓	✓
Home Labelling	Home Labelling	✓						
Union								
Resource Acquisition	C&I Custom	✓	✓	✓	✓	✓	✓	✓
	C&I Direct Install			✓	✓	✓	✓	✓
	C&I Prescriptive	✓	✓	✓	✓	✓	✓	✓
	Energy Savings Kit	✓						
	Home Reno Rebate	✓	✓	✓	✓	✓	✓	✓
	Residential Adaptive Thermostats					✓	✓	✓
Low Income	Home Weatherization	✓	✓	✓	✓	✓	✓	✓
	Furnace End-of-Life		✓	✓	✗	✓	✗	✗
	Multifamily (Social and Assisted)		✓	✓	✓	✓	✓	✓
	Multifamily (Market Rate)		✓	✓	✓	✓	✓	✓
	Indigenous			✓	✓	✓	✗	✗
	Affordable Housing Conservation	✓						
Large Volume	Large Volume	✓	✓	✓	✓	✓	✓	✓
Market Transformation	Optimum Home	✓	✓	✓	✓	✓	✓	✓
	Commercial New Construction		✗	✓	✓	✓	✓	✓
Performance Based	RunSmart		✓	✓	✓	✓	✓	✗
	Strategic Energy Management		✓	✗	✓	✗	✓	✓

✓=Offered and reported ✗=Offered but no activity reported

Table 11-2 shows how the metrics under each scorecard have changed over time.

Table 11-2. Energy efficiency metrics – 2016 through 2021

Scorecard	Metric	2016	2017	2018	2019	2020	2021
Enbridge							
Resource Acquisition	Large Volume Customer Savings (CCM)	✓	✓	✓	✓	✓	✓
	Small Volume Customer Savings (CCM)	✓	✓	✓	✓	✓	✓
	Home Energy Conservation - Participants	✓	✓	✓	✓	✓	✓
Low Income	Home Winterproofing (CCM)	✓	✓	✓	✓	✓	✓
	Low Income Multi-Residential (CCM)	✓	✓	✓	✓	✓	✓
	Low Income New Construction – Project Applications	✓	✓	✓	✓	✓	✓
Market Transformation	Commercial Savings by Design – New Developments	✓	✓	✓	✓	✓	✓
	Comprehensive Energy Management – Participants	✓	✓	✓	✓	✓	✓
	Residential Savings by Design – Builders	✓	✓	✓	✓	✓	✓
	Residential Savings by Design – Homes Built			✓	✓	✓	✓
	Run it Right – Participants	✓	✓	✓	✓	✓	✓
	School Energy Competition - Schools	✓	✓	✓	✓	✓	✓
Union							
Resource Acquisition	CCM	✓	✓	✓	✓	✓	✓
	Home Reno Rebate - Participants	✓	✓	✓	✓	✓	✓
Large Volume	CCM	✓	✓	✓	✓	✓	✓
Low Income	Single Family CCM	✓	✓	✓	✓	✓	✓
	Multifamily Social & Assisted CCM	✓	✓	✓	✓	✓	✓
	Multifamily Market Rate CCM	✓	✓	✓	✓	✓	✓
Market Transformation	Commercial New Construction - New Enrolled Developments	✓	✓	✓	✓	✓	✓
	Optimum Home - % of Homes Built	✓		✓	✓	✓	✓
	Optimum Home - Participating Builders		✓	✓	✓		
	Optimum Home - Homes		✓	✓	✓		
Performance Based	RunSmart - Participants	✓	✓	✓	✓	✓	✓
	RunSmart - Savings %		✓	✓	✓	✓	✓
	Strategic Energy Management - Participants	✓	✓	✓			
	Strategic Energy - Savings %			✓	✓	✓	✓

The OEB hired the EC team to develop an overall evaluation, measurement, and verification (EM&V) plan and lead an annual verification of the reported utility DSM savings and scorecard achievements. This report is a result of that annual verification.

This report applies the results of several, previously completed studies:

- A study measuring the free ridership within the custom projects[31] implemented in the 2018 program year[32]
- A study verifying the custom project savings (CPSV) during the 2017 and 2018 program years[33,34]
- A study verifying the prescriptive project savings from prescriptive projects implemented in the 2017 program year[35]
- A study of custom measure lives, completed in May 2018.[36]
- A study of the spillover resulting from the implementation of custom projects during the 2013-2014 program years, completed in May 2018.[37]

[31] Low Income custom projects were not included in the NTG study.

[32] 2018 Natural Gas Demand Side Management Free-ridership Evaluation, DNV for the Ontario Energy Board, December 27, 2019

[33] 2017-2018 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, December 26, 2019

[34] Due to complications from the COVID-19 pandemic, the EC was unable to complete planned studies verifying the custom project savings (CPSV) from the 2019, 2020, and 2021 program years. Instead, the EC used the same adjustment factors resulting from custom projects implemented in the 2017 and 2018 program years, adjusted for the mix of projects installed in 2019, 2020, and 2021.

[35] 2017 C&I Prescriptive Verification: Final Report – Measurement of NTG Factors and Gross Savings Verification, Itron for the Ontario Energy Board, June 7, 2019

[36] Final Report: Custom Measure Life Review, Michaels Energy for the Ontario Energy Board, May 10, 2018

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

11.2 Appendix B: Metric Verification Activities

To verify the metric achievements, the EC conducted the activities outlined in Table 11-3 and Table 11-4. The utilization of each activity depends on the "type" of measure being reviewed. DNV defined four different types of measures, listed below. A single program or scorecard metric may have more than one type of measure.

Prescriptive (P): Prescriptive gas savings measures are those where all savings inputs can be identified in the technical resource manual (TRM). This includes not only the prescribed savings but also additional prescribed inputs such as expected useful life (EUL) and free ridership rates.

Custom (C): Custom gas savings measures are those gas measures of equipment or actions (tune up, process) which are not prescribed by the TRM. Examples include measures verified as part of the CPSV process as well as non-prescribed programs like Run it Right.

Whole Home (W): Whole home savings are savings calculated using home modelling software (HOT2000).

Other (O): In addition to direct gas savings measures, the scorecards recognize additional metrics, such as the number of enrolled participants, new developments, or schools in a program or the percentage of homes built by a participating builder achieving certain efficiency levels.

Activities to verify the measures fall into three general categories. As previously stated, the utilization of each method is determined by the measure type.

- **Confirm Tracking:** Confirmation that the entries and calculations within the submitted tracking data accurately contribute to scorecard metrics.
  - *Prescriptive measures:* The EC confirmed that measure-level inputs were applied from the TRM where appropriate (such as savings per unit), then recalculated gross and net savings based on those inputs to verify the tracked net savings for a census of measures.
  - *Custom measures:* The EC used the results of the custom project savings verification, free ridership, and spillover studies conducted through separate processes.
  - *Whole Home and Other measures:* The EC confirmed that tracking records matched utility-reported achievement. Additional verification took place in other activities.
- **Apply Factors:** Application of relevant factors that are not otherwise applied in the TRM, such as gross savings adjustments, free ridership adjustments, and spillover ratios.
  - *Prescriptive measures*: The EC used the results of the C&I Prescriptive Verification and installation rate studies conducted through separate processes.
  - *Custom measures*: The EC used the results of the CPSV, free ridership, and spillover studies conducted through separate processes.
- **Desk Review:** File review of utility-provided documentation to verify whether the achievements in the tracking data were actually realized. Unless specifically mentioned otherwise, desk review methods were similar to those used in the prior verification.
  - *Whole Home:* Desk review included tasks such as review of energy software (HOT2000) modelling records for whole home programs.
  - *Other:* For scorecards with Other metrics, program achievements such as customer participation, eligibility for participation, and developer homes were evaluated using program records specific to each scorecard, program, and metric.

Table 11-3 and Table 11-4 identify the measure types within each scorecard and program as well as the method used to evaluate that program, corresponding with the measure type.

Table 11-3. 2021 Annual verification activities by program: Enbridge

Scorecard	Program	Measure Types	Confirm Tracking	Apply Factors	Desk Review
Resource Acquisition	C&I Custom	C		✓	
	C&I Direct Install	P	✓	✓	
	C&I Prescriptive	P	✓	✓	
	Comprehensive Energy Management	C		✓	
	Energy Leaders	C	✓	✓	✓
	Home Energy Conservation	W O	✓	✓	✓
	Residential Adaptive Thermostats	P	✓	✓	
	Run it Right	C	✓	✓	✓
Low Income	Home Winterproofing	P W	✓	✓	✓
	Multi-Residential	P C	✓	✓	
	New Construction	O	✓		✓
Market Transformation	Commercial Savings by Design	O	✓		✓
	Comprehensive Energy Management	O	✓		✓
	Residential Savings by Design	O	✓		✓
	Run it Right	O	✓		✓
	School Energy Competition	No 2021 activity reported			

Table 11-4. 2021 Annual verification activities by program: Union

Scorecard	Program	Measure Types	Confirm Tracking	Apply Factors	Desk Review
Resource Acquisition	C&I Custom	C		✓	
	C&I Direct Install	P	✓	✓	
	C&I Prescriptive	P	✓	✓	
	Home Reno Rebate	W O	✓	✓	✓
	Residential Adaptive Thermostats	P	✓	✓	
Large Volume	Large Volume	C	✓	✓	
Low Income	Indigenous	No 2021 activity reported			
	Furnace End-of-Life	No 2021 activity reported			
	Home Weatherization	P W	✓	✓	✓
	Multifamily Social & Assisted	P C	✓	✓	
	Multifamily Market Rate	P C	✓	✓	
Market Transformation	Commercial New Construction	O	✓		✓
	Optimum Home	O	✓		✓
Performance Based	RunSmart	No 2021 activity reported			
	Strategic Energy Management	O	✓		✓

Desk reviews of Whole Home and Other measures require additional information beyond what is provided in the tracking data. For example, the EC requested HOT2000 files and other documentation to confirm participation and eligibility for a sample of relevant participants in the Home Energy Conservation, Home Reno Rebate, Winterproofing, and Home Weatherization programs. Table 11-5 and Table 11-6 show the number of projects for which the EC requested additional documentation.

Table 11-5. Desk Review Sample: Enbridge

Scorecard	Program	Sample Requested
Resource Acquisition	Home Energy Conservation	30 Randomly Selected Homes
	Run it Right	10 Randomly Selected Projects
	Energy Leaders	Census
Low Income	Home Winterproofing	30 Randomly Selected Homes
	New Construction	Census
Market Transformation	Commercial Savings by Design	10 Randomly Selected Sites
	Comprehensive Energy Management	Census
	Residential Savings by Design	10 Randomly Selected Builders
		5 Randomly Selected Homes
	Run it Right	15 Randomly Selected Participants

Table 11-6. Desk Review Sample: Union

Scorecard	Program	Sample Requested
Resource Acquisition	Home Reno Rebate	30 Randomly Selected Homes
Low Income	Home Weatherization	30 Randomly Selected Homes
Market Transformation	Optimum Home	5 Randomly Selected Homes
	Commercial New Construction	10 Randomly Selected Projects
Performance-Based	Strategic Energy Management	Census

11.3 Appendix C: Changes from 2020 Annual Verification

There were no major changes between the 2020 and 2021 program year evaluations, but several small changes did occur. These included:

- **Programs not previously executed**: Enbridge's Energy Leaders was implemented/executed in 2021 but had not been since 2018.
- **Programs previously executed**: Enbridge's School Energy Competition and Union's RunSmart programs were implemented/executed in 2020 but had no activity in 2021. Union's Indigenous and Furnace End-of-Life programs, which were last executed and implemented in 2019, continued to report no activity in 2021.
- **Changed scorecard metrics:** There were no changes between 2020 and 2021 scorecard metrics.

11.4 Appendix D: Summary of Verification Adjustments

Table 11-7 and Table 11-8 provide a combined summary of metrics for Enbridge programs and Union programs, respectively. These tables show where the EC made adjustments of greater than 1% from the values identified in *tracking data*.

Table 11-7. Enbridge Metrics with Verified Value Greater than 1% Different from Tracked

Programs	Metrics	>1% Difference?
Resource Acquisition		
C&I Custom	Large Volume Customers CCM	
C&I Direct Install		
C&I Prescriptive		
Comprehensive Energy Management		
Energy Leaders		✓
Run it Right		
Home Energy Conservation (HEC)	Small Volume Customers CCM	
Residential Adaptive Thermostats		
C&I Custom		
C&I Direct Install		
C&I Prescriptive		
Energy Leaders		
Comprehensive Energy Management		
Home Energy Conservation (HEC)	HEC Participants	
Low Income		
Home Winterproofing	LISF (CCM)	
Low Income Multi-Residential	LIMR (CCM)	
Low Income New Construction	LINC Applications	
Market Transformation		
School Energy Competition	SEC Schools	
Run it Right	RiR Participants	
Comprehensive Energy Management	CEM Participants	
Residential Building by Design	RSBD Builders	
	RSBD Homes	
Commercial Building by Design	CSBD Developments	

Table 11-8. Union Metrics with Verified Value Greater than 1% Different from Tracked

Programs	Metrics	>1% Difference?
Resource Acquisition		
Home Reno Rebate	RA (CCM)	
Residential Adaptive Thermostats		
C&I Custom		
C&I Direct Install		
C&I Prescriptive		
Home Reno Rebate	HRR Participants	
Low Income		
Home Weatherization	LISF (CCM)	✓
Furnace End-of-Life		
Indigenous		
Multi-Family	LIMF-SA (CCM)	
	LIMF-MR (CCM)	
Large Volume		
Large Volume	LV (CCM)	
Market Transformation		
Optimum Home	Percentage of Homes Built	
Commercial New Construction	CNC Developments	
Performance Based		
RunSmart	RS Participants	
	RS Savings %	
Strategic Energy Management	SEM Savings %	

11.5 Appendix E: Resource Acquisition Scorecards

This appendix describes the detailed process used to verify the metrics for the Resource Acquisition Scorecard programs for Enbridge (Table 11-9) and Union (Table 11-10). The programs addressed in this appendix are:

- Residential Home Retrofit – Home Energy Conservation – Enbridge
- Residential Home Retrofit – Home Reno Rebate – Union
- Residential Adaptive Thermostats – Enbridge
- Residential Adaptive Thermostats – Union
- C&I – Prescriptive – Enbridge
- C&I – Prescriptive – Union
- C&I – Direct Install – Enbridge
- C&I – Direct Install – Union
- C&I – Custom – Enbridge
- C&I – Custom – Union
- Comprehensive Energy Management – Enbridge
- Energy Leaders – Enbridge
- Run it Right – Enbridge

Table 11-9. Enbridge 2021 Resource Acquisition scorecard*[38]

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
Home Energy Conservation	Large Volume Customer - CCM	-	430,134,894	381,230,912	508,307,882	762,461,823	40.00%
Residential Adaptive Thermostats		-					
C&I Custom		398,994,369					
C&I Direct Install		6,734,536					
C&I Prescriptive		20,068,154					
Comprehensive Energy Management		3,090,423					
Energy Leaders		908,004					
Run it Right		339,409					
Home Energy Conservation	Small Volume Customer - CCM	203,375,694	317,200,551	179,362,258	239,149,677	358,724,516	40.00%
Residential Adaptive Thermostats		53,483,128					
C&I Custom		17,002,246					
C&I Direct Install		25,245,015					
C&I Prescriptive		18,209,452					
Comprehensive Energy Management		-					
Energy Leaders		-					
Run it Right		-114,983					
Home Energy Conservation	Participants	15,321	15,321	7,541	10,054	15,081	20.00%

*Not all values may compute exactly due to rounding.

[38] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Schedule C

Table 11-10. Union 2021 Resource Acquisition scorecard*[39]

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
Home Reno Rebate	CCM	92,340,855	635,084,369	576,545,784	768,727,712	1,153,091,568	75.00%
Residential Adaptive Thermostats		23,183,355					
C&I Custom		470,976,925					
C&I Direct Install		18,403,367					
C&I Prescriptive		30,179,867					
Home Reno Rebate	Participants	5,032	5,032	4,553	6,070	9,105	25.00%

*Not all values may compute exactly due to rounding.

[39] Ibid.

11.5.1 Residential Home Retrofit - Home Energy Conservation – Enbridge

Overview

Table 11-11 shows the tracked and verified scorecard achievements for the 2021 Enbridge Home Energy Conservation (HEC) Program, with the metrics of CCM savings and participants (homes). As a result of this review, the EC verifies 203,375,694 CCM (100.00% of tracked) and 15,321 participants (100.00% of tracked). Each metric is discussed separately in this section, starting with the participants metric. Table 11-11 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-11. Enbridge Resource Acquisition achievement: Home Energy Conservation metrics*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	-	-	-
Small Volume Customer - CCM	203,375,694	203,375,694	100.00%
Participants (Homes)	15,321	15,321	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-12 to verify the metrics for the Home Energy Conservation program.

Table 11-12. Documentation used to verify the Home Energy Conservation program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	Various documents for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049

Participant Selection

Enbridge provided the Tracking File listing 15,321 individual participants in the HEC program. To certify the scorecard metrics, the EC randomly selected 30 participants for review, requested additional documentation, confirmed receipt of the correct files, and reviewed documents to verify participation and eligibility.

Received Files

The folder had the following information:

- Photographs of pre- and post-installation conditions
- HOT2000 Model input or “Simulation” Files (.h2k)
- HOT2000 Model Output Files (.xls) aggregated in one spreadsheet

Participants Metric

Table 11-13 shows the tracked and verified scorecard achievements for the 2021 Enbridge HEC program with the metric of participant homes.

Table 11-13. Enbridge Resource Acquisition achievement: HEC Program participants metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Participants (Homes)	15,321	15,321	100.00%

*Not all values may compute exactly due to rounding.

Verify Participation and Eligibility

The Resource Acquisition Scorecard identifies one metric for the program as "Residential Deep Savings Participants (Homes)". To determine the definition of "participants," the EC looked first to the OEB Decision, which identified approval of the Enbridge Home Energy Conservation program.[40] The EC next looked to Enbridge's plan, which identified the following criteria:[41,42]

1. Be a residential homeowner in the EGD franchise area
2. Have a valid Enbridge Gas account in good standing
3. Use an approved Certified Energy Evaluator ("CEE")
4. Install at least two measures
5. Complete a pre- and post-energy audit
6. Achieve an average of at least 15% gas savings across all participants[43]

The EC evaluated the sampled participant files against the criteria above and determined:

- **Criterion 1:** Enbridge appropriately redacted Personally Identifiable Information (PII) in all of the project files, including customer name and address. However, each file contained an Enbridge account number, providing confirmation that the records were for Enbridge customers and thus within the service territory.
- **Criterion 2:** Each file contained an Enbridge account number, providing confirmation that the records were for Enbridge customers in good standing at the time of the project.
- **Criterion 3:** At the conclusion of the 2019 evaluation, Enbridge confirmed that their administrative process for contracting with Service Organizations includes a requirement to be NRCan-licensed and for the Service Organizations to ensure that all Energy Advisors remain certified, registered, and in good standing. While the EC does not have 100% certainty about certification status at the time of audit, we accept Enbridge's process as sufficient for this criterion.
- **Criterion 4:** The tracking data for all 15,321 records (including the 30 sampled) indicated that at least two measure types were installed at each location, with 24 homes (of the total population) receiving as many as seven.
- **Criterion 5:** Each project contained pre- and post- project photos. Photo documentation was not comprehensive for all measures, but did partially exist for each sampled project, confirming inspections did occur. In combination with submitted modelling files, the EC found that all projects satisfied this requirement.
- **Criterion 6:** As decided by the EAC in 2016, the EC uses the same criterion applied to the equivalent Union program, which is a 15% *average* savings across all homes. Tracking data, corroborated by HOT2000 model files, showed an average of 15.09% for the 30 sample projects reviewed, which was identical to the percentage predicted by the

[40] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Page 13
[41] Enbridge's Proposed 2015-2020 DSM Plan, EB-2015-0049, Exhibit B, Tab 2, Schedule 2, Page 19 of 55
[42] Enbridge's Proposed 2015-2020 DSM Plan, EB-2015-0049, Exhibit B, Tab 2, Schedule 1, Page 25 of 100
[43] Enbridge's plan is internally inconsistent on this point. In some areas, each house must achieve at least 15% savings. In others, the program must achieve 15% average across all homes. The EAC has chosen to use the second (average) criteria for evaluation.

Tracking File for those 30 homes. This gave the EC confidence in the average natural gas savings of 17.55% across all participants in the Tracking File. Therefore, the EC verified that the homes meeting this criterion.

In addition to these six criteria, the EAC identified one additional criterion for homes that installed air sealing. The EC also identified baseline adjustments occurring on some installed furnaces measures in addition to updating eligibility for participants who installed furnace measures.

- **Criterion 7:** For air sealing to qualify as a measure, the EAC determined that a reduction of at least 10% of the cubic feet per minute of air leakage (as measured by a documented blower-door test) must occur. Tracking data for all projects that claimed air sealing as an installed measure identified a reduction of 10% or more. Therefore, the air sealing measure qualified for all air sealing measures that were claimed.
- **Criterion 8:** As part of an effort to achieve deeper savings, starting January 1, 2021, Enbridge required participants who installed a furnace to install 2 additional measures. At the same time, governmental regulations came into force requiring all new furnaces to have at least 95% AFUE. Enbridge provided documentation and additional explanation to show adjusted furnace baselines based on pre- and post-audit dates. If a participant installed a furnace plus one measure and had a pre audit date before January 2021, they were determined to be eligible as a program participant.

Table 11-14 shows the measure types installed by the verified participants in the program, broken out by the number of total measure types installed per customer. The most common measure type was air sealing upgrade, with 15,018 total installations. Air sealing was most common in homes with only two measures; of the 7,299 homes with only two measures, 7,148 participants (98%) installed air sealing.

Table 11-14. Count of individual measure types among verified projects and types per home*

Measure Type	Number of Measure Types by Customer						Total	% of Total Homes
	Two	Three	Four	Five	Six	Seven		
Air Sealing Rebate	7,148	5,141	2,097	463	145	24	15,018	98%
Attic Rebate	6,644	4,124	1,922	415	136	24	13,265	87%
Furnace Rebate	-	3,465	1,688	352	134	24	5,663	37%
Water Heater Rebate	296	1,550	1,397	296	103	24	3,666	24%
Window/Door Rebate	142	808	691	352	141	24	2,158	14%
Basement Rebate	83	480	561	326	134	24	1,608	10%
Wall Rebate	26	104	132	121	83	24	490	3%
Boiler Rebate	259	84	36	15	6	-	400	3%
Total Measure Types	**14,598**	**15,756**	**8,524**	**2,340**	**882**	**168**	**42,268**	**N/A**
Total Homes	**7,299**	**5,252**	**2,131**	**468**	**147**	**24**	**15,321**	**N/A**

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC verifies that 15,321 homes satisfy the requirements of participation (100.00% of tracked).

CCM Savings Metric

Table 11-15 shows the tracked and verified scorecard achievements for the 2021 Enbridge HEC program with the metric of CCM savings.

Table 11-15. Enbridge Resource Acquisition scorecard achievements: HEC Program CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	-	-	-
Small Volume Customer - CCM	203,375,694	203,375,694	100.00%
TOTAL	**203,375,694**	**203,375,694**	**100.00%**

*Not all values may compute exactly due to rounding.

Verify Tracked Savings

In calculating net CCM savings, the EC first utilized Enbridge tracking data to identify the savings for each of the tracked projects. The EC confirmed that the measure life and free ridership multipliers were correctly applied and reviewed the documentation for the sample of 30 program participants to identify whether the gross energy savings in the project files matched the gross energy savings in the tracking data. If any of the 30 projects did not match, an average savings-weighted realization rate was calculated and applied to the tracking savings to produce verified savings.

Calculate Realization Rate

The EC used a multi-step process to verify tracked energy savings for the 30 sampled homes, shown in Figure 11-1 for the 2021 HEC verification. The process was necessary because the simulation mode (EnerGuide or Expert[44]) used by program delivery agents is not available to non-certified professionals. While the EC can attempt to run the Expert simulations in General mode, the runs may produce error warnings or result in a savings differential between the Expert result and General result. Therefore, this multi-step process was developed to verify savings:

- EC requested simulation (H2K) and output (XLS) files from the program
- Where possible, the simulation file was re-run and the results used to verify the tracking savings. If different simulation versions or modes were used, the savings could be slightly different; therefore, simulation savings were considered "verified" if they were within 2% of the tracking savings; in this case, the tracked savings value was accepted as the verified savings.
- If a simulation file was not provided, the file inputs were incompatible with General mode and would not run, the file ran but produced an error due to version or mode differences, or the file produced a difference in savings greater than 2%, the output file was used to verify the tracking savings. As with the simulation file, the EC accepted tracking savings values within 2% of the output file value as the verified savings.
- If the EC was unable to verify the tracking savings against the output file, the EC requested additional documentation from the program (utility) to explain the discrepancy. This documentation explained the adjustments used to calculate approved furnace baselines for accurate reported savings values.
- If no additional documentation or explanation was available, the EC compared the output file values to the project documentation to determine whether they were consistent. If they were not consistent, the output file value was used as the verified value.

[44] "Expert" is the mode listed in the output files. This mode is also labelled as "EnerGuide" in simulation files. The EC uses both terms.

Figure 11-1. Overview of Gross Savings Verification for 2021 HEC Verification

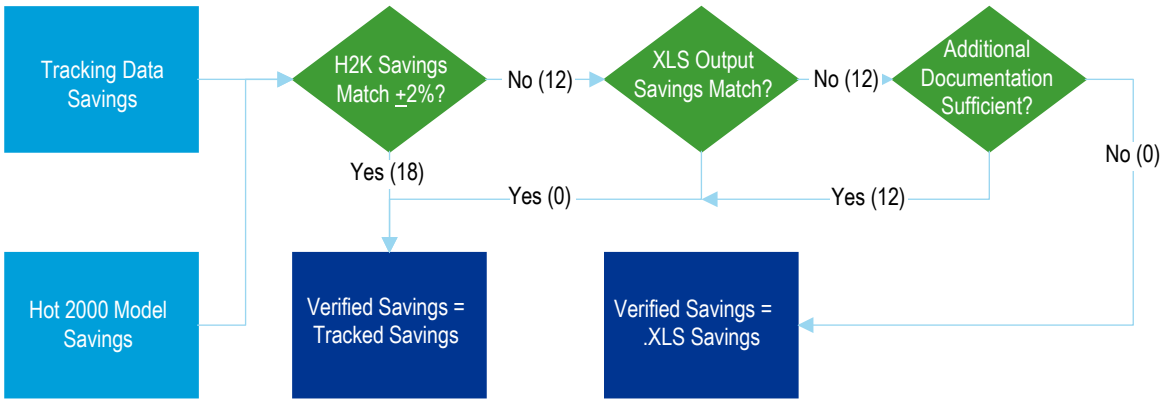


Table 11-16 shows how many customers were verified in each evaluation step.

Table 11-16. Overview of gross savings verification

Evaluation Step	# Verified
Simulation re-run (H2K) and compared to tracking, verified if ± 2%	18
Output files for (XLS) compared to tracking, verified if ± 2%	0
Additional Explanation request	12
Comparison to output file values	0
Total Verified	**30**

The gross savings realization rate (RR) is 100.00%, shown in Table 11-17.

Table 11-17. Enbridge HEC Realization Rate*

Numbers of Houses	Realization Rate	90% Confidence Interval			
		Absolute Precision	Lower Bound	Upper Bound	Relative Precision
30	100%	0.00%	100.00%	100.00%	0.00%

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC confirms total savings of 203,375,694 CCM for Enbridge's Home Energy Conservation CCM savings metric (100.00% of tracked).

11.5.2 Residential Home Retrofit - Home Reno Rebate – Union

Overview

Table 11-18 shows the tracked and verified scorecard achievements for the 2021 Union Home Reno Rebate (HRR) program, with the metrics of CCM savings and homes built. As a result of this review, the EC verifies 92,340,855 CCM (100.00% of tracked) and 5,032 participants (100.00% of tracked). Each metric is discussed separately in this section, starting with the participants metric. Table 11-18 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-18. Union Resource Acquisition achievement: Home Reno Rebate metrics*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM	92,340,855	92,340,855	100.00%
Participants (Homes)	5,032	5,032	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-19 to verify the metrics for the Home Reno Rebate program.

Table 11-19. Documentation used to verify the Home Reno Rebate program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Project Files	Various documents for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029

Participant Selection

Union provided the Tracking File listing 5,032 individual participants in the HRR program. To certify the scorecard metric, the EC randomly selected 30 participants for review, requested additional documentation, confirmed receipt of the correct files, and reviewed documents to verify participation and eligibility.

Received Files

The typical file folder had the following information:

- Photographs of pre- and post-installation conditions
- HOT2000 Model simulation or "Simulation" Files (.h2k)
- HOT2000 Model Output Files (.xls) aggregated in one spreadsheet

Participants Metric

Table 11-20 shows the tracked and verified scorecard achievements for the 2021 Union HRR program with the metric of participant homes.

Table 11-20. Union Resource Acquisition achievement: HRR Program participants metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Participants (Homes)	5,032	5,032	100.00%

*Not all values may compute exactly due to rounding.

Verify Participation and Eligibility

The Resource Acquisition Scorecard identifies one metric for the program as "Home Reno Rebate Participants (Homes)". To determine the definition of "participants," the EC looked first to the OEB Decision, which approved the Union HRR program[45]. The EC looked next to Union's plan, which identified the following criteria:[46]

> *Homes that count as a participant towards the Home Reno Rebate ("HRR") Participant (Homes) metric must meet the following two requirements:*
>
> > *1. A homeowner must complete at least two eligible renovations as outlined at Exhibit A, Tab 3, Appendix A, Section 1.0, Table 1.*
> >
> > *2. The aggregate of all of the homes counted towards the metric must achieve, on average, at least a 15% reduction in annual natural gas use as determined through comparing a pre and post energy assessment.*

The EC evaluated the sampled participant files against the criteria above and determined:

- **Criterion 1:** The EC confirmed that the project files documented at least two eligible measures for all homes, not only those sampled. Upon review, all participants met this requirement. Table 11-21 shows the measure types and number of measures in the homes that met this requirement.
- **Criterion 2:** Of the 30 homes randomly sampled, tracking files allowed the EC to calculate average savings of 22.62%. The EC further calculated from tracking data that the population of homes satisfied the 15% requirement, with an average of 25.24% savings across all homes.

Table 11-21 shows the measure types installed by the program, broken out by the number of total measure types installed per customer. The most common measure type was air sealing, with 4,827 total measures performed. The air sealing rebate was most common in homes with only two measures; of the 1,925 homes with only two measures, 1,838 (95%) performed air sealing.

[45] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Page 13
[46] Union's Proposed 2015-2020 DSM Plan, EB-2015-0029, Exhibit A, Tab 3, Page 24 of 73

Table 11-21. Count of individual measure types among verified projects and types per home*

Measure Type	Number of Measure Types by Customer						Total	% of Total Homes
	Two	Three	Four	Five	Six	Seven		
Air Sealing Rebate	1,838	1,623	872	367	108	19	4,827	96%
Attic Rebate	1,594	1,148	743	340	104	19	3,948	78%
Window/Door Rebate	124	671	573	324	104	19	1,815	36%
Basement Rebate	137	432	446	305	109	19	1,448	29%
Furnace Rebate	-	645	458	211	97	19	1,430	28%
Water Heater Rebate	74	383	309	137	63	19	985	20%
Wall Rebate	37	126	231	204	81	19	698	14%
Boiler Rebate	46	33	12	7	-	-	98	2%
Total Measure Types	**3,850**	**5,061**	**3,644**	**1,895**	**666**	**133**	**15,249**	**N/A**
Total Homes	**1,925**	**1,687**	**911**	**379**	**111**	**19**	**5,032**	**N/A**

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC verifies that all 5,032 homes (100.00%) satisfy the requirements for participation.

CCM Savings Metric

Table 11-22 shows the tracked and verified scorecard achievements for the 2021 Union HRR program with the metric of CCM savings.

Table 11-22. Union Resource Acquisition scorecard achievements: HRR Program savings metric*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM	92,340,855	92,340,855	100.00%

*Not all values may compute exactly due to rounding.

Verify Tracked Savings

In calculating Net Cumulative Cubic Meters (CCM) savings, the EC first utilized Union Tracking Data to identify the savings for each of the tracked projects, confirming that the measure life and free ridership multipliers were correctly applied. Union Tracking data includes all projects as individual records within the tracking data, allowing for a simple summing of tracked savings. The EC reviewed the documentation for the sample of 30 program participants to identify whether the gross energy savings in the project files matched the gross energy savings in the tracking data. If any of the 30 projects did not match, an average savings-weighted realization rate was calculated and applied to the tracking savings to produce verified savings.

Calculate Realization Rate

For the 2021 HRR verification, the EC used a multi-step process to verify tracked energy savings for the sampled homes, shown in Figure 11-2. The process was necessary because the simulation mode (EnerGuide or Expert[47]) used by program delivery agents is not available to non-certified professionals. While the EC can attempt to run the Expert simulations in

[47] "Expert" is the mode listed in the output files. This mode is also labelled as "EnerGuide" in simulation files. The EC uses both terms.

General mode, the runs may produce error warnings or result in a savings differential between the Expert result and General result. Therefore, this multi-step process was developed to verify savings:

- EC requested simulation (HSE) and output (TSV) files from the program
- Where possible, the simulation file was re-run and the results used to verify the tracking savings. If different simulation versions or modes were used, the savings could be slightly different; therefore, simulation savings were considered "verified" if they were within 2% of the tracking savings; in this case, the tracked savings value was accepted as the verified savings.
- If a simulation file was not provided, the file inputs were incompatible with General mode and would not run, the file ran but produced an error due to version or mode differences, or the file produced a difference in savings greater than 2%, the output file was used to verify the tracking savings. As with the simulation file, the EC accepted tracking savings values within 2% of the output file value as the verified savings.
- If the EC was unable to verify the tracking savings against the output file, the EC requested additional documentation from the program (utility) to explain the discrepancy. This documentation explained the adjustments used to calculate approved furnace baselines for accurate reported savings values.
- If no additional documentation or explanation was available, the EC compared the output file values to the project documentation to determine whether they were consistent.

Figure 11-2. Overview of gross savings verification for 2021 HRR verification

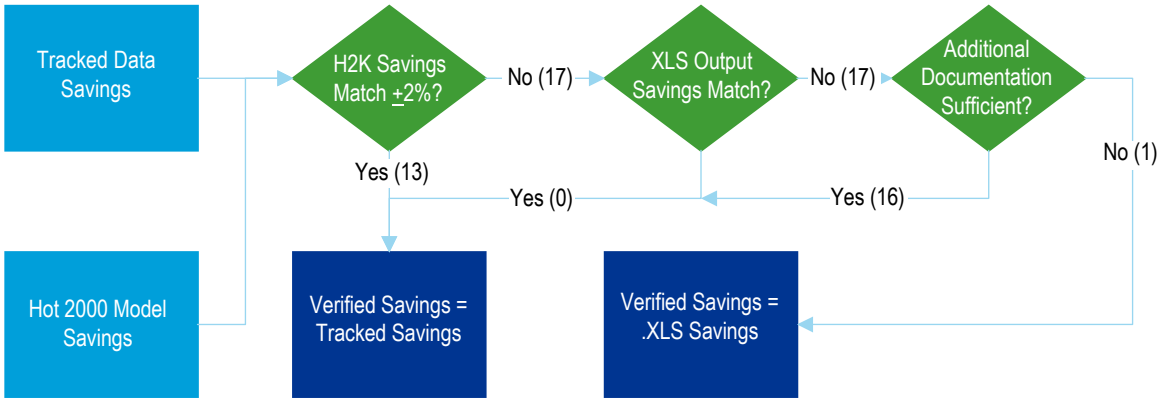


Table 11-23 shows how many customers were verified in each evaluation step.

Table 11-23. Overview of gross savings verification

Evaluation Step	# Verified
Simulation re-run (H2K) and compared to tracking, verified if ± 2%	13
Output files for (XLS) compared to tracking, verified if ± 2%	0
Additional Explanation request	16
Comparison to output file values	1
Total Verified	**30**

The EC produced verified savings for all 30 homes in the sample. The gross savings realization rate (RR) is 100.00%, shown in Table 11-24.

Table 11-24. Union HRR realization rate*

Numbers of Houses	Realization Rate	90% Confidence Interval			
		Absolute Precision	Lower Bound	Upper Bound	Relative Precision
30	100.00%	0.00%	100.00%	100.00%	0.00%

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC confirms the total savings of 92,340,855 CCM for Union's Home Reno Rebate CCM savings metric (100.00% of tracked).

11.5.3 Residential Adaptive Thermostats - Enbridge

Overview

Table 11-25 shows the tracked and verified scorecard achievements for the 2021 Enbridge Residential Adaptive Thermostat Program, with the metric of CCM savings. As a result of this review, the EC verifies 53,483,128 CCM (100.00% of tracked). Table 11-25 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-25. Enbridge Resource Acquisition achievement: Residential Adaptive Thermostats CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	-	-	-
Small Volume Customer - CCM	53,483,128	53,483,128	100.00%
TOTAL	**53,483,128**	**53,483,128**	**100.00%**

*Not all values may compute exactly due to rounding.

Documentation

The EC used documentation shown in Table 11-26 to verify the metrics for the Residential Adaptive Thermostat program.

Table 11-26. Documentation used to verify the Residential Adaptive Thermostats program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0
Adaptive Thermostat Ping Report	2021 Adaptive Thermostats Ping Reports LUG and LEG

Verify Cumulative Natural Gas Savings

The EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. In calculating gas savings, the EC used:

- Tracking File data, which reported 24,178 units
- TRM 5.0
- Adaptive Thermostat Ping Report, which reported 82.52% installation rate[48]

[48] The Residential Adaptive Thermostat Offering provides participants with a point-of-sale instant discount for purchasing adaptive thermostat. Ecobee supported Enbridge by "pinging" its devices claiming the offering's discount, allowing Ecobee to identify which purchased thermostats have been installed and connected to the internet. In early 2022, Ecobee pinged all Ecobee adaptive thermostats purchased online through the 2021 point-of-sale instant discount offer. If a device was determined to be online during at least one of three pings, it was considered an installed device, and an installation verification adjustment factor was determined using this information (installed devices / all devices pinged). The adjustment factor was applied to all adaptive thermostats purchased through the 2021 point-of-sale instant discount offer (including in-store Ecobee purchased devices and non-Ecobee devices). For legacy Enbridge, 3,120 devices were determined to be installed out of 3,781 total devices pinged (82.52% installation rate).

The EC certified the tracked savings, for a savings ratio of 100.00%.[49]

Verification Result

As a result of this review, the EC confirms the savings of 53,483,128 CCM (100.00% of tracked) for Enbridge's Residential Adaptive Thermostat small volume customer CCM metric.

[49] The savings ratio is 100% because the program used the same 82.52% installation rate as the EC, so the EC verifies 100% of the savings reported by the program.

11.5.4 Residential Adaptive Thermostats - Union

Overview

Table 11-27 shows the tracked and verified scorecard achievements for the 2021 Union Residential Adaptive Thermostat Program, with the metric of CCM savings. As a result of this review, the EC verifies 23,183,355 CCM (100.00% of tracked). Table 11-27 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-27. Union Resource Acquisition achievement: Residential Adaptive Thermostats CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM	23,183,355	23,183,355	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used documentation shown in Table 11-28 to verify the metrics for the Residential Adaptive Thermostat program.

Table 11-28. Documentation used to verify the Residential Adaptive Thermostats program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016, OEB Mid-Term Review, EB-2017-0127/EB-2017-0128, and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0
Adaptive Thermostat Ping Report	2021 Adaptive Thermostats Ping Reports LUG and LEG

Verify Cumulative Natural Gas Savings

The EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. In calculating gas savings, the EC used:

- Tracking File data, which reported 10,334 units
- TRM 5.0
- Adaptive Thermostat Ping Report, which reported 84.19% installation rate[50]

[50] The Residential Adaptive Thermostat Offering provides participants with a point-of-sale instant discount for purchasing adaptive thermostat. Ecobee supported Enbridge by "pinging" its devices claiming the offering's discount, allowing Ecobee to identify which purchased thermostats have been installed and connected to the internet. In early 2022, Ecobee pinged all Ecobee adaptive thermostats purchased online through the 2021 point-of-sale instant discount offer. If a device was determined to be online during at least one of three pings, it was considered an installed device, and an installation verification adjustment factor was determined using this information (installed devices / all devices pinged). The adjustment factor was applied to all adaptive thermostats purchased through the 2021 point-of-sale instant discount offer (including in-store Ecobee purchased devices and non-Ecobee devices). For legacy Union, 1,395 devices were determined to be installed out of 1,657 total devices pinged (84.19% installation rate).

The EC certified the tracked savings, for a savings ratio of 100.00%.[51]

Verification Result

As a result of this review, the EC confirms the savings of 23,183,355 CCM (100.00% of tracked) for Union's Residential Adaptive Thermostat CCM metric.

[51] The savings ratio is 100% because the program used the same 84.19% installation rate as the EC, so the EC verifies 100% of the savings reported by the program.

11.5.5 C&I - Prescriptive – Enbridge

Overview

Table 11-29 shows the tracked and verified scorecard achievements for the 2021 Enbridge C&I Prescriptive program, with the metric of CCM savings. As a result of this review, the EC verifies total savings of 38,277,606 CCM for large and small volume customers (100.00% of tracked). Table 11-29 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documents section.
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values.

Table 11-29. Enbridge Resource Acquisition achievement: C&I Prescriptive CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	20,068,154	20,068,154	100.00%
Small Volume Customer - CCM	18,209,451	18,209,452	100.00%
TOTAL	**38,277,605**	**38,277,606**	**100.00%**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-30 to verify the metrics for the C&I Prescriptive program.

Table 11-30. Documentation used to verify the C&I Prescriptive program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016, and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0
C&I Prescriptive Verification Study	2017 C&I Prescriptive Study – Measure of NTG Factors and Gross Savings Verification, Itron, June 2019
Commercial ENERGY STAR Combi Oven Sub Doc	White paper detailing prescriptive savings, costs, and assumptions for combination ovens

Verify Cumulative Natural Gas Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. Table 11-31 and Table 11-32 show the results of the analysis.

Table 11-31. Enbridge Resource Acquisition achievement by measure group: small volume customers*

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Air Curtain	4	304,779	304,779	100.00%
Demand Control Kitchen Ventilation	28	1,849,011	1,849,011	100.00%
Demand Control Ventilation	42	40,700	40,700	100.00%
Destratification Fan	12	413,087	413,087	100.00%
Energy Recovery Ventilation	25	2,023,787	2,023,787	100.00%
Fryer	368	4,974,182	4,974,182	100.00%
Heat Recovery Ventilation	2	85,014	85,014	100.00%
Make-Up Air Unit	1	228,000	228,000	100.00%
Ozone Washer Extractor	1	704,145	704,145	100.00%
Oven	59	524,544	524,544	100.00%
Dock Door Seal	211	5,800,149	5,800,149	100.00%
Steam Cooker	2	170,669	170,669	100.00%
Water Heater	160	1,091,386	1,091,386	100.00%
Total	**915**	**18,209,451**	**18,209,452**	**100.00%**

*Not all values may compute exactly due to rounding.

Table 11-32. Enbridge Resource Acquisition achievement by measure group: large volume customers*

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Broiler	1	24,106	24,106	100.00%
Demand Control Kitchen Ventilation	11	569,458	569,458	100.00%
Demand Control Ventilation	89	215,569	215,569	100.00%
Destratification Fan	35	1,380,645	1,380,645	100.00%
Energy Recovery Ventilation	7	98,221	98,221	100.00%
Fryer	147	1,986,970	1,986,970	100.00%
Heat Recovery Ventilation	3	1,627,388	1,627,388	100.00%
Ozone Washer Extractor	3	1,306,046	1,306,046	100.00%
Oven	25	231,994	231,994	100.00%
Dock Door Seal	505	11,778,642	11,778,642	100.00%
Steam Cooker	3	256,003	256,003	100.00%
Unit Heater	13	288,017	288,017	100.00%
Water Heater	42	305,098	305,098	100.00%
Total	**884**	**20,068,154**	**20,068,154**	**100.00%**

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC confirms the savings of 18,209,452 CCM for small volume customers (100.00% of tracked) and 20,068,154 CCM for large volume customers (100.00% of tracked) for Enbridge's C&I Prescriptive Program.

11.5.6 C&I - Prescriptive – Union

Overview

Table 11-33 shows the shows the tracked and verified scorecard achievements for the 2021 Union C&I Prescriptive program, with the metric of CCM savings. As a result of this review, the EC verifies 30,179,867 CCM (100.00% of tracked). Table 11-33 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-33. Union Resource Acquisition achievement: C&I Prescriptive CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM	30,179,865	30,179,867	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-34 to verify the metrics for the C&I Prescriptive program.

Table 11-34. Documentation used to verify the C&I Prescriptive program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0
C&I Prescriptive Verification Study	2017 C&I Prescriptive Study – Measure of NTG Factors and Gross Savings Verification, Itron, June 2019
Commercial ENERGY STAR Combi Oven Sub Doc	White paper detailing prescriptive savings, costs, and assumptions for combination ovens

Verify Cumulative Natural Gas Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. Table 11-35 shows the results of the analysis.

Table 11-35. Union Resource Acquisition Achievement by measure group*

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Air Curtain	13	367,170	367,170	100.00%
Steam Cooker	2	170,669	170,669	100.00%
Dock Door Seal	230	2,228,615	2,228,615	100.00%
Oven	50	469,181	469,181	100.00%
Demand Control Kitchen Ventilation	36	2,977,452	2,977,452	100.00%
Demand Control Ventilation	143	6,253,081	6,253,081	100.00%
Destratification Fan	27	770,904	770,904	100.00%
Energy Recovery Ventilation	970	4,877,407	4,877,407	100.00%
Fryer	284	3,838,771	3,838,771	100.00%
Heat Recovery Ventilation	23	1,133,253	1,133,253	100.00%
Make-Up Air Unit	11	4,541,825	4,541,825	100.00%
Ozone Washer Extractor	2	625,051	625,051	100.00%
Unit Heater	13	140,600	140,600	100.00%
Water Heater	237	1,785,886	1,785,888	100.00%
Total	**2,041**	**30,179,865**	**30,179,867**	**100.00%**

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC confirms the savings of 30,179,867 CCM savings (100.00% of tracked) for Union's C&I Prescriptive Program.

11.5.7 C&I – Direct Install – Enbridge

Overview

Table 11-36 shows the tracked and verified scorecard achievements for the 2021 Enbridge C&I Direct Install Program, with the metric of CCM savings. As a result of this review, the EC verifies total savings of 31,979,551 CCM for large and small volume customers (100.00% of tracked). Table 11-36 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-36. Enbridge Resource Acquisition achievement: C&I Direct Install CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	6,734,536	6,734,536	100.00%
Small Volume Customer - CCM	25,245,015	25,245,015	100.00%
TOTAL	**31,979,551**	**31,979,551**	**100.00%**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-37 to verify the metrics for the C&I Direct Install program.

Table 11-37. Documentation used to verify the C&I Direct Install program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0

Verify Cumulative Natural Gas Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. Three measures were installed, with 253 individual installations with large volume customers and 493 with small volume customers. The EC verified the tracked savings which resulted in a savings ratio of 100.00%.

Table 11-38. Enbridge C&I Direct Installation measure groups: large volume customers

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Air Curtain	16	1,354,605	1,354,605	100.00%
Dock Door Seal	236	5,130,143	5,130,143	100.00%
Demand Control Kitchen Ventilation	1	249,788	249,788	100.00%
TOTAL	**253**	**6,734,536**	**6,734,536**	**100.00%**

Table 11-39. Enbridge C&I Direct Installation measure groups: small volume customers

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Air Curtain	201	15,823,257	15,823,257	100.00%
Dock Door Seal	268	5,964,765	5,964,765	100.00%
Demand Control Kitchen Ventilation	24	3,456,993	3,456,993	100.00%
TOTAL	**493**	**25,245,015**	**25,245,015**	**100.00%**

Verification Result

As a result of this review, the EC confirms the savings of 6,734,536 CCM for large volume customers (100.00% of tracked) and 25,245,015 CCM for small volume customers (100.00% of tracked) for Enbridge's C&I Direct Install Program.

11.5.8 C&I – Direct Install – Union

Overview

Table 11-40 shows the tracked and verified scorecard achievements for the 2021 Union C&I Direct Install Program, with the metric of CCM savings. As a result of this review, the EC verifies total savings of 18,403,367 CCM (100.00% of tracked). Table 11-40 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-40. Union Resource Acquisition achievement: C&I Direct Install CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM	18,403,367	18,403,367	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-41 to verify the metrics for the C&I Direct Install program.

Table 11-41. Documentation used to verify the C&I Direct Install program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0

Verify Cumulative Natural Gas Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. Three measures were installed, with 306 individual installations. The EC verified the tracked savings which resulted in a savings ratio of 100.00%.

Table 11-42. Union C&I Direct Installation measure groups

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Air Curtain	146	12,464,646	12,464,646	100.00%
Demand Control Kitchen Ventilation	11	1,868,389	1,868,389	100.00%
Dock Door Seal	149	4,070,332	4,070,332	100.00%
TOTAL	**306**	**18,403,367**	**18,403,367**	**100.00%**

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC confirms the savings of 18,403,367 (100.00% of tracked) for Union's C&I Direct Install Program.

11.5.9 C&I - Custom – Enbridge

Overview

Table 11-43 shows the shows the tracked and verified scorecard achievements for the 2021 Enbridge C&I Custom program, with the metric of CCM savings. As a result of this review, the EC verifies total savings of 415,996,615 CCM (99.98%% of tracked). Table 11-43 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-43. Enbridge Resource Acquisition achievement: C&I Custom CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	399,069,686	398,994,369	99.98%
Small Volume Customer - CCM	17,002,246	17,002,246	100.00%
TOTAL	**416,071,931**	**415,996,615**	**99.98%**

*Not all values may compute exactly due to rounding.

Table 11-44 includes these variables:

- Tracking Gross Savings: Gross cumulative tracking savings for all customers in the Enbridge C&I Custom program. This is the amount of savings before any adjustments (including free ridership and spillover) are applied.
- RR: Gross realization rate from the 2017-2018 CSPV report.
- Att: Attribution ratio (the complement of free ridership) from the 2018 NTG report.
- Spillover: Spillover ratio from the 2013-2014 Spillover Study.
- Adj: Adjustment Ratio, the product of the RR and the sum of the Att ratio and Spillover ratio

Equation 1: Adjustment Ratio

$$\boldsymbol{Adjustment\ Ratio = RR * (Att + Spillover)}$$

- Verified Net Savings: Cumulative gross savings multiplied by the Adjustment Ratio

Equation 2: Verified Net Savings

$$Verified\ Net\ Savings = Adjustment\ Ratio * (Cumulative\ Gross)$$

Table 11-44. Adjustment factors applied to Enbridge C&I Custom Program cumulative gross savings*

Attribution Group	Tracking Gross Savings (CCM)	RR (%)	Att (%)	Spillover (%)	Adj (%)	Verified Net Savings (CCM)
Commercial - Other	9,658,241	94.99%	25.65%	1.36%	25.66%	2,477,995
Commercial - Ventilation	14,918,504	94.99%	14.12%	1.36%	14.70%	2,193,684
Commercial - Boilers	98,113,708	94.99%	42.37%	1.36%	41.54%	40,755,578
Multi-Residential - Heating	121,098,351	121.09%	57.67%	8.24%	79.81%	96,649,101
Multi-Residential - Other	48,890,404	121.09%	69.73%	8.24%	94.41%	46,159,324
Industrial	394,812,679	110.79%	50.62%	1.45%	57.69%	227,760,932
TOTAL	**687,491,887**				**60.51%**	**415,996,615**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-45 to verify the metrics for the C&I Custom program.

Table 11-45. Documentation used to verify the C&I Custom program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
2017-2018 CPSV Report	2018 Natural Gas Demand Side Management Custom Savings Verification[52,53]
2018 NTG Report	2018 Natural Gas Demand Side Management Free-ridership Evaluation[54]
2013-2014 Spillover Study	CPSV Participant Spillover Results[55]

Verify Savings

Adjustment Values – Realization Rate

The 2017-2018 CPSV Report conveyed gross realization rate by sector, as shown in Table 11-46. The EC used the same sectors to apply the relevant rates at the measure level.

Table 11-46. Verified gross savings rates for the Enbridge Custom C&I program

Sector	RR (%)
Commercial	94.99%
Low Income & Multi Residential	121.09%
Industrial	110.79%

Adjustment Values – Attribution Ratios

The 2018 NTG Report conveyed attribution ratios using a combination of sector and measure group, as shown in Table 11-47.

Table 11-47. Attribution ratios for the Enbridge Custom C&I program

Attribution Group	Att (%)
Commercial - Other	25.65%
Commercial - Ventilation	14.12%
Commercial - Boilers	42.37%
Multi-Residential - Heating	57.67%
Multi-Residential - Other	69.73%
Industrial	50.62%

[52] 2017-2018 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, December 26, 2019

[53] The EC did not complete studies verifying the custom project savings (CPSV) during the 2019, 2020, or 2021 program years. Instead, the EC used the same adjustment factors resulting from custom projects implemented in the 2017 and 2018 program years, adjusted for the mix of projects installed in 2021.

[54] 2018 Natural Gas Demand Side Management Free-ridership Evaluation, DNV for the Ontario Energy Board, December 27, 2019

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

Adjustment Values – Spillover Ratios

The 2013-2014 Spillover Study conveyed spillover ratios at the sector level, as shown in Table 11-48. The EC used the same sectors to apply the relevant rates at the measure level.

Table 11-48. Spillover ratios for the Enbridge Custom C&I program

Sector	Spillover (%)
Custom Commercial	1.36%
Multi-Residential	8.24%
Custom Industrial	1.45%

Verify Cumulative Natural Gas Savings

The program-level adjustment factors shown in Table 11-44 were built up from a measure-level application of the RR, Attribution, and Spillover ratios. Each measure was assigned a RR or Spillover ratio based on its sector, and an Attribution ratio based on the combination of sector and measure group. The EC calculated the measure-level net savings using Equation 1 and Equation 2, then summed the measure-level savings to produce program-level savings. The EC calculated the program-level adjustment ratio by dividing the program-level net savings by the program-level gross savings.

Verification Result

As a result of this review, the EC confirms the savings of 415,996,615 CCM (99.98% of tracked) for Enbridge's C&I Custom Program.

11.5.10 C&I - Custom – Union

Overview

Table 11-49 shows the shows the tracked and verified scorecard achievements for the 2021 Union C&I Custom program, with the metric of CCM savings. As a result of this review, the EC verifies total savings of 470,976,925 CCM (100% of tracked). Table 11-49 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-49. Union Resource Acquisition achievement: C&I Custom CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM	470,976,925	470,976,925	100.00%

*Not all values may compute exactly due to rounding.

Table 11-50 includes these variables:

- Tracking Gross Savings: Gross cumulative tracking savings for all customers in the Enbridge C&I Custom program. This is the amount of savings before any adjustments (including free ridership and spillover) are applied.
- RR: Gross realization rate from the 2017-2018 CSPV report
- Att: Attribution ratio (the complement of free ridership) from the 2018 NTG Report
- Spillover: Spillover ratio from 2013-2014 Spillover Study
- Adj: Adjustment Ratio, the product of the RR and the sum of the Att ratio and Spillover ratio

Equation 3: Adjustment Ratio

$$\boldsymbol{Adjustment\ Ratio = RR * (Att + Spillover)}$$

- Verified Net Savings: Cumulative gross savings multiplied by the Adjustment Ratio

Equation 4: Verified Net Savings

$$Verified\ Net\ Savings = Adjustment\ Ratio * (Cumulative\ Gross)$$

Table 11-50.Adjustment factors applied to Union C&I Custom Program cumulative gross savings*

Attribution Group	Tracking Gross Savings (CCM)	RR (%)	Att (%)	Spillover (%)	Adj (%)	Verified Net Savings (CCM)
Agricultural	804,353,457	91.17%	50.16%	0.89%	46.54%	374,364,478
Commercial and Multi-Family	155,334,242	90.57%	28.62%	0.00%	25.92%	40,264,397
Industrial - Steam or Hot Water System	73,291,585	91.17%	4.11%	0.89%	4.56%	3,340,997
Industrial – HVAC	66,585,113	91.17%	39.88%	0.89%	37.17%	24,749,692
Industrial - Steam or Hot Water System	103,763,451	91.17%	28.98%	0.89%	27.23%	28,257,360
TOTAL	**1,203,327,848**				**39.14%**	**470,976,925**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-51 to verify the metrics for the C&I Custom program.

Table 11-51. Documentation used to verify the C&I Custom program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
2017-2018 CPSV Report	2018 Natural Gas Demand Side Management Custom Savings Verification[56,57]
2018 NTG Report	2018 Natural Gas Demand Side Management Free-ridership Evaluation[58]
2013-2014 Spillover Study	CPSV Participant Spillover Results[59]

Verify Savings

Adjustment Values – Realization Rate

The 2017-2018 CPSV Report conveyed gross realization rate by sector, as shown in Table 11-52. The EC used the same sectors to apply the relevant rates at the measure level.

Table 11-52. Verified gross savings rates for the Union Custom C&I program

Sector	RR (%)
Agricultural & Industrial	91.17%
Commercial and Multi-Family	90.57%

Adjustment Values – Attribution Ratios

The 2018 NTG Report conveyed attribution ratios using a combination of sector and measure group, as shown in Table 11-53.

Table 11-53. Attribution ratios for the Union Custom C&I program

Attribution Group	Att (%)
Agricultural	50.16%
Commercial and Multi-Family	28.62%
Industrial - Steam or Hot Water System	4.11%
Industrial - HVAC	39.88%
Industrial - Steam or Hot Water System	28.98%

[56] 2017-2018 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, December 26, 2019

[57] The EC did not complete studies verifying the custom project savings (CPSV) during the 2019, 2020, or 2021 program years. Instead, the EC used the same adjustment factors resulting from custom projects implemented in the 2017 and 2018 program years, adjusted for the mix of projects installed in 2021.

[58] 2018 Natural Gas Demand Side Management Free-ridership Evaluation, DNV for the Ontario Energy Board, December 27, 2019

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

Adjustment Values – Spillover Ratios

The 2013-2014 Spillover Study conveyed spillover ratios at the sector level, as shown in Table 11-54. The EC used the same sectors to apply the relevant rates at the measure level.

Table 11-54. Spillover ratios for the Union Custom C&I program

Sector	Spillover (%)
Industrial	0.89%
Commercial and Multi-Family	0.00%

Verify Cumulative Natural Gas Savings

The program-level adjustment factors shown in Table 11-50 were built up from a measure-level application of the RR, Attribution, and Spillover ratios. Each measure was assigned a RR or Spillover ratio based on its sector, and an Attribution ratio based on the combination of sector and measure group. The EC calculated the measure-level net savings using Equation 3 and Equation 4, then summed the measure-level savings to produce program-level savings. The EC calculated the program-level adjustment ratio by dividing the program-level net savings by the program-level gross savings.

Verification Result

As a result of this review, the EC verifies total savings of 470,976,925 CCM (100% of tracked) for Union's C&I Custom Program.

11.5.11 Comprehensive Energy Management – Enbridge

Overview

Table 11-55 shows the shows the tracked and verified scorecard achievements for the 2021 Enbridge Comprehensive Energy Management (CEM) program, with the metric of CCM savings. The CEM Program has two metrics under separate scorecards, CCM Savings (Resource Acquisition) and Participants (Market Transformation). CCM Savings are discussed here, while the Participants metric is discussed in Section 11.9. As a result of this review, the EC verifies total savings of 3,090,423 CCM (100.00% of tracked) for large volume customers. Table 11-55 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-55. Enbridge Resource Acquisition achievement: Comprehensive Energy Management CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	3,090,423	3,090,423	100.00%
Small Volume Customer - CCM	-	-	-
TOTAL	**3,090,423**	**3,090,423**	**100.00%**

*Not all values may compute exactly due to rounding.

Table 11-56 includes these variables:

- Tracking Gross Savings: Gross cumulative tracking savings for all customers in the Enbridge CEM program. This is the amount of savings before any adjustments (including free ridership and spillover) are applied.
- RR: Gross realization rate from the 2017-2018 CSPV report.
- Att: Attribution ratio (the complement of free ridership) from the 2018 NTG report.
- Spillover: Spillover ratio from the 2013-2014 Spillover Study.
- Adj: Adjustment Ratio, the product of the RR and the sum of the Att ratio and Spillover ratio

Equation 5: Adjustment Ratio

$$\boldsymbol{Adjustment\ Ratio = RR * (Att + Spillover)}$$

- Verified Net Savings: Cumulative gross savings multiplied by the Adjustment Ratio

Equation 6: Verified Net Savings

$$Verified\ Net\ Savings = Adjustment\ Ratio * (Cumulative\ Gross)$$

Table 11-56. Adjustment factors applied to Enbridge CEM Program cumulative gross savings*

Attribution Group	Tracking Gross Savings (CCM)	RR (%)	Att (%)	Spillover (%)	Adj (%)	Verified Net Savings (CCM)
Industrial	5,357,100	110.79%	50.62%	1.45%	57.69%	3,090,423
TOTAL	**5,357,100**				**57.69%**	**3,090,423**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-57 to verify the metrics for the Comprehensive Energy Management program.

Table 11-57. Documentation used to verify the Comprehensive Energy Management program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
2017-2018 CPSV Report	2018 Natural Gas Demand Side Management Custom Savings Verification[60,61]
2018 NTG Report	2018 Natural Gas Demand Side Management Free-ridership Evaluation[62]
2013-2014 Spillover Study	CPSV Participant Spillover Results[63]

Verify Savings

The CPSV, NTG, and Spillover reports that were the source of the following adjustment values did not include projects installed as a part of the Comprehensive Energy Management program. However, DNV has assumed that the Industrial measures included in those studies are also representative of the Comprehensive Energy Management Program and therefore the adjustment values are applicable.

Adjustment Values – Realization Rate

The 2017-2018 CPSV Report conveyed gross realization rate by sector, as shown in Table 11-58. The EC used the same sectors to apply the relevant rates at the measure level.

Table 11-58. Verified gross savings rates for the Enbridge CEM program

Sector	RR (%)
Industrial	110.79%

Adjustment Values – Attribution Ratios

The 2018 NTG Report conveyed attribution ratios using a combination of sector and measure group, as shown in Table 11-59.

Table 11-59. Attribution ratios for the Enbridge CEM program

Attribution Group	Att (%)
Industrial	50.62%

[60] 2017-2018 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, December 26, 2019

[61] The EC did not complete studies verifying the custom project savings (CPSV) during the 2019, 2020, or 2021 program years. Instead, the EC used the same adjustment factors resulting from custom projects implemented in the 2017 and 2018 program years, adjusted for the mix of projects installed in 2021.

[62] 2018 Natural Gas Demand Side Management Free-ridership Evaluation, DNV for the Ontario Energy Board, December 27, 2019

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

Adjustment Values – Spillover Ratios

The 2013-2014 Spillover Study conveyed spillover ratios at the sector level, as shown in Table 11-60. The EC used the same sectors to apply the relevant rates at the measure level.

Table 11-60. Spillover ratios for the Enbridge CEM program

Sector	Spillover (%)
Custom Industrial	1.45%

Verify Cumulative Natural Gas Savings

The program-level adjustment factors shown in Table 11-56 were built up from a measure-level application of the RR, Attribution, and Spillover ratios. Each measure was assigned a RR or Spillover ratio based on its sector, and an Attribution ratio based on the combination of sector and measure group. The EC calculated the measure-level net savings using Equation 5 and Equation 6, then summed the measure-level savings to produce program-level savings. The EC calculated the program-level adjustment ratio by dividing the program-level net savings by the program-level gross savings.

Verification Result

As a result of this review, the EC confirms the savings of 3,090,423 CCM (100% of tracked) for Enbridge's Comprehensive Energy Management Program.

11.5.12 Energy Leaders – Enbridge

Overview

Table 11-61 shows the tracked and verified scorecard achievements for the 2021 Enbridge Energy Leaders program, with the metric of CCM savings. As a result of this review, the EC verifies total savings of 908,004 CCM (97.42% of tracked) for large volume customers. Table 11-61 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-61. Enbridge Resource Acquisition achievement: Run it Right CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	932,080	908,004	97.42%
Small Volume Customer - CCM	-	-	-
TOTAL	**932,080**	**908,004**	**97.42%**

*Not all values may compute exactly due to rounding.

Table 11-62 includes the following variables:

- Tracking Gross Savings: Gross cumulative tracking savings for all customers in the Enbridge Energy Leaders program.
- RR: Gross realization rate based on engineering reviews.
- Att: Attribution ratio (the complement of free ridership), deemed based on EAC consensus.
- Spillover: Spillover ratio, deemed based on EAC consensus.
- Adj: Adjustment Ratio, the product of the RR and the sum of the Att ratio and Spillover ratio

Equation 7: Adjustment Ratio

$$\boldsymbol{Adjustment\ Ratio = RR * (Att + Spillover)}$$

- Verified Net Savings: Cumulative gross savings multiplied by the Adjustment Ratio

Equation 8: Verified Net Savings

$$Verified\ Net\ Savings = Adjustment\ Ratio * (Cumulative\ Gross)$$

Table 11-62. Adjustment Factors Applied to Enbridge Energy Leaders Program cumulative gross savings*

Measure Type	Tracking Gross Savings (CCM)	RR (%)	Att (%)	Spillover (%)	Adj* (%)	Verified Net Savings (CCM)
Large Volume Customers CCM	932,080	97.42%	100.00%	0.00%	97.42%	908,004

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-63 to verify the metrics for the Energy Leaders program.

Table 11-63. Documentation used to verify the Energy Leaders program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	PDF documents for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049

Participant Selection

Enbridge first provided the Tracking File listing Energy Leaders participants with customer and site IDs, listing 3 individual projects. The EC requested full documentation for all projects.

Received Files

The EC received pdf files for each project listed in the Tracking File. PDF files generally included:

- Project summary
- Customer invoice for project incentive
- Custom Project Documentation Review Checklist
- Program Application Form
- Custom project documentation (ETools)
- Site evaluation/audit documentation
- Manufacturer invoice
- Installation invoice

Verify Gross Savings

In 2021, program participation consisted of a single commercial property manager replacing domestic hot water (DHW) boilers at three facilities with gas air-source heat pumps (GAHP).

GAHP Retrofit Projects

The EC reviewed the calculations to determine whether the savings estimates for the GAHP projects were reasonable. The program calculated savings using the following equation, which the EC deems appropriate.

$$Nat.Gas\ Savings\ = Q * 1/HHV * 1/\Delta E_t$$

In which:

Q = DHW heating load (BTU/hr)

$$Q = GPM * C * \rho * \Delta T * 60$$

In which,

GPM = flowrate of water (gallon per minute)

C = Specific heat of water (BTU/lb/°T)

ρ = density of water (lb/gallons)

ΔT = Temperature difference between input and output

HHV = High Heating Value of natural gas (BTU/m^3)

ΔE_t = Difference in thermal efficiencies of heating systems

The custom project documentation shows the inputs used in the equation.

The three projects utilized metered DHW water flowrate from a single facility, and contractor-reported maximum system flowrate (at system design conditions) as the basis of the GPM values used in the equations above. Upon investigation, the EC found that the meter data contained negative flow values. Additional data provided by Enbridge revealed that the flowmeters were not properly calibrated, which resulted in negative numbers where there should have been zero values. The EC adjusted the minimum metered flowrate to represent zero flowrate, which had no impact on the savings.

The EC also found that the maximum flowrate of the GAHPs, at design conditions, was insufficient to fully serve the DHW load at one facility, which meant that the existing DHW boiler would have to be used as a secondary unit to serve any excess load. As a result, the EC decreased the savings for that project by 3.4%, leading to an overall reduction in Energy Leaders savings of 2.58%.

Adjustment Values – Attribution and Spillover Ratios

In evaluating the 2016 programs, the EAC agreed to deem the Attribution and Spillover ratios at 100.00% and 0%, respectively. These deemed values continued into 2021. Therefore, the adjustment factor is equal to the realization rate.

Verification Result

As a result of this review, the EC confirms the savings of 908,004 CCM (97.42% of tracked) for large volume customers of the Energy Leaders program.

11.5.13 Run it Right – Enbridge

Overview

Table 11-64 shows the tracked and verified scorecard achievements for the 2021 Enbridge Run it Right (RIR) Program, with the metric of CCM savings. The RIR Program has two metrics under separate scorecards, CCM Savings (Resource Acquisition) and Participants (Market Transformation). CCM Savings are discussed here, while the Participants metric is discussed in Section 11.9. As a result of this review, the EC verifies total savings of 224,426 CCM (100.00% of tracked) for large and small volume customers. Table 11-64 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-64. Enbridge Resource Acquisition achievement: Run it Right CCM metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Large Volume Customer - CCM	339,409	339,409	100.00%
Small Volume Customer - CCM	-114,983	-114,983	100.00%
TOTAL	**224,426**	**224,426**	**100.00%**

*Not all values may compute exactly due to rounding.

Table 11-65 includes the following variables:

- Tracking Gross Savings: Gross cumulative tracking savings for all customers in the Enbridge 2021 Run it Right program.
- RR: Gross realization rate based on engineering reviews.
- Att: Attribution ratio (the complement of free ridership) from the 2015 CPSV report.
- Spillover: Spillover ratio from 2013-2014 Spillover Study.
- Adj: Adjustment Ratio, the product of the RR and the sum of the Att ratio and Spillover ratio

Equation 9: Adjustment Ratio

$$\boldsymbol{Adjustment\ Ratio = RR * (Att + Spillover)}$$

- Verified Net Savings: Cumulative gross savings multiplied by the Adjustment Ratio

Equation 10: Verified Net Savings

$$Verified\ Net\ Savings = Adjustment\ Ratio * (Cumulative\ Gross)$$

Table 11-65. Adjustment Factors Applied to Run it Right Program cumulative gross savings*

Measure Type	Tracking Gross Savings (CCM)	RR (%)	Att (%)	Spillover (%)	Adj* (%)	Verified Net Savings (CCM)
Large Volume Customers CCM	678,005	100.00%	50.06%	0.00%	50.06%	339,409
Small Volume Customers CCM	-229,690	100.00%	50.06%	0.00%	50.06%	-114,983

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-66 to verify the metrics for the Run it Right program.

Table 11-66. Documentation used to verify the Run it Right program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	PDF document for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
2015 CPSV Report	2015 Natural Gas Demand Side Management Custom Savings Verification and Free-ridership Evaluation[64]
2013-2014 Spillover Study	CPSV Participant Spillover Results[65]

Participant Selection

Enbridge first provided the Tracking File listing RIR participants with customer and site IDs, listing 29 individual participants. The EC randomly selected 10 participants, requesting full documentation by Project ID.

Methodology Review

The program methodology did not change for the 2021 program year. For the certification, a senior engineer reviewed the calculation methods for each selected site. The following conclusion from the 2015 certification[66] remains valid:

> *The methodology used by the RIR program to estimate savings is appropriate for the application. No significant concerns were identified by the team; however, the RIR tool does not allow observation of all of the calculations performed.*

Verify Gross Savings

For 2021, evaluation engineers reviewed the supporting documentation provided in the Project Files (pdf) for the sample of sites to identify the answers to the following questions:

- Is the building type correctly identified?
- How many months were used in the baseline, improvement, and reference periods?
- What type of model was used?
- What independent variables were used?
- What R-squared values were used for the baseline and reference models?
- What is the estimated savings during the reference period?
- Were capital project savings deducted?
- What percentage of consumption do the savings represent?
- What is driving the positive or negative savings claimed?
- Should a new baseline model be created?

[64] 2016 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, June 31, 2018
[65] CPSV Participant Spillover Results, DNV for the Ontario Energy Board, May 23, 2018
[66] 2015 Natural Gas Demand Side Management Annual Verification, DNV for the Ontario Energy Board, December 20, 2018, Appendix F

The EC senior engineer used these questions (above) to review the calculations completed, the consumption pattern at the facility, and the baseline model. The EC senior engineer then asked three primary questions to assess the risk of savings accuracy as Low, Normal, or High. Three key questions were:

- Based on experience, is the baseline model specification reasonable?
- Based on experience, is the baseline time period definition reasonable?
- What is the assessed level of risk for achieving savings?

The baseline model specifications and time period definitions were reasonable for all projects examined. Overall, the savings claimed are reasonable, in part because both positive and negative savings are included in the program Tracking File and Project Files.

The EC assigned six sites as low-risk, two normal-risk, and two high-risk. Based on our experience, this distribution is similar to comparable programs. Across the participants, all savings claims were supported by actions taken at the facilities. Clear changes in consumption patterns occurred. The EC's review supports the savings claim for all sites.

Adjustment Values – Attribution and Spillover Ratios

The 2015 CPSV Report conveyed a single attribution ratio for the Run it Right program of 50.06%. The 2013-2014 Spillover study did not find any spillover savings for the program.[67] The two ratios (attribution and spillover) were combined with the RR to produce a program-level adjustment factor of 50.06%.

Verification Result

As a result of this review, the EC confirms the savings of 224,426 CCM (100.00% of tracked) for customers of the Run it Right program.

[67] Neither the attribution ratio nor the spillover value have been updated in more recent iterations of these reports.

11.6 Appendix F: Low Income Scorecards

This appendix describes the detailed process used to verify the metrics for the Low Income Scorecard programs for Enbridge (Table 11-67) and Union (Table 11-68). The programs addressed in this appendix are:

- Winter Retrofit - Furnace End-of-Life – Union
- Winter Retrofit - Home Winterproofing – Enbridge
- Winter Retrofit - Home Weatherization – Union
- Winter Retrofit - Indigenous Program – Union
- Low Income New Construction – Enbridge
- Low Income Multi-Residential – Affordable Housing Program – Enbridge
- Low Income Multi-Residential – Multifamily Program (Social Assisted) – Union
- Low Income Multi-Residential – Multifamily Program (Market Rate) – Union

Table 11-67. Enbridge 2021 Low Income scorecard[68]

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
Home Winterproofing	CCM	26,443,935	26,443,935	21,577,192	28,769,589	43,154,383	45.00%
Low Income Multi-Residential	CCM	88,304,418	88,304,418	69,641,327	92,855,103	139,282,654	45.00%
Low Income New Construction	Applications	13	13	10	13	19	10.00%

Table 11-68. Union 2021 Low Income scorecard[69]

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
Home Weatherization	CCM	45,903,844	45,903,844	39,563,598	52,751,464	79,127,196	60.00%
Furnace End-of-Life		-					
Indigenous		-					
Multi-Family Social & Assisted	CCM	9,535,480	9,535,480	13,085,633	17,447,511	26,171,267	35.00%
Multi-Family Market Rate	CCM	8,307,799	8,307,799	8,962,524	11,950,032	17,925,049	5.00%

[68] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, FINAL REVISED February 24, 2016, Schedule C
[69] Ibid

11.6.1 Winter Retrofit - Furnace End-of-Life Program – Union

No activity was reported for this program in 2021.

11.6.2 Winter Retrofit – Home Winterproofing – Enbridge

Overview

Table 11-69 shows the tracked and verified scorecard achievements for the 2021 Enbridge Home Winterproofing program, with the metric of CCM savings. As a result of this review, the EC verifies 26,443,935 CCM (100% of tracked). Table 11-69 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-69. Enbridge Low Income achievements: Home Winterproofing CCM metrics*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM – Prescriptive	5,455,712	5,455,712	100.00%
CCM - Whole Home	20,988,223	20,988,223	100.00%
TOTAL	**26,443,935**	**26,443,935**	**100.00%**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-70 to verify the metrics for the Home Winterproofing program.

Table 11-70. Documentation used to verify the Home Winterproofing program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	Various documents for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
TRM 4.0	Natural Gas Demand Side Management Technical Resource Manual, Version 4.0
TAPS Report	TAPS Verification Program 2012 Year End Research Report, Quadra Research. April 2013[70]

Simulation-based Savings

Participant Selection

Enbridge provided the tracking file listing 1,040 individual participant homes in the Winterproofing program. To certify the scorecard metric, the EC randomly selected 30 participants for review, requested additional documentation, confirmed receipt of the correct files, and reviewed documents to verify participation and eligibility.

[70] TAPS Verification Program 2012 Year End Research Report, Study CR-604, Quadra Research, April 3, 2013

Received Files

The typical file folder had the following information:

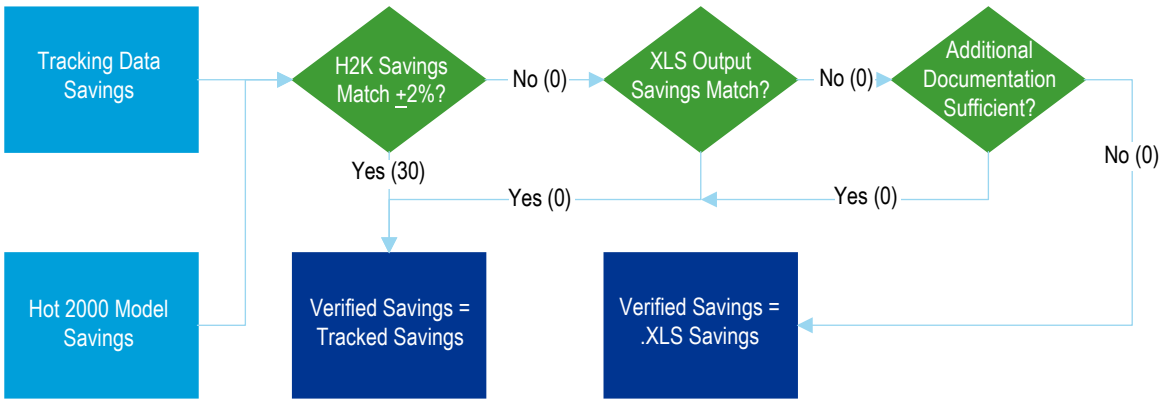
- Photographs of pre- and post-installation conditions
- HOT2000 Model simulation Files (.h2k)
- HOT2000 Model Output Files (.xls)

Calculate Realization Rate

The EC used a multi-step process to verify tracked energy savings for the 30 sampled homes, shown in Figure 11-3 for the 2021 Winterproofing verification. The process was necessary because the simulation mode (EnerGuide or Expert[71]) used by program delivery agents is not available to non-certified professionals. While the EC can attempt to run the Expert simulations in General mode, the runs may produce error warnings or result in a savings differential between the Expert result and General result. Therefore, this multi-step process was developed to verify savings:

- EC requested simulation (H2K) and output (XLS) files from the program
- Where possible, the simulation file was re-run and the results used to verify the tracking savings. If different simulation versions or modes were used, the savings could be slightly different; therefore, simulation savings were considered "verified" if they were within 2% of the tracking savings; in this case, the tracked savings value was accepted as the verified savings.
- If a simulation file was not provided, the file inputs were incompatible with General mode and would not run, the file ran but produced an error due to version or mode differences, or the file produced a difference in savings greater than 2%, the output file was used to verify the tracking savings. As with the simulation file, the EC accepted tracking savings values within 2% of the output file value as the verified savings.
- If the EC was unable to verify the tracking savings against the output file, the EC requested additional documentation from the program (utility) to explain the discrepancy.
- If no additional documentation or explanation was available, the EC compared the output file values to the project documentation summary to determine whether they were consistent. If they were not consistent, the output file value was used as the verified value.

Figure 11-3. Overview of gross simulation savings verification for 2021 Winterproofing



[71] "Expert" is the mode listed in the output files. This mode is also labelled as "EnerGuide" in simulation files. The EC uses both terms.

Table 11-71 shows how many customers were verified in each evaluation step.

Table 11-71. Overview of gross simulation savings verification

Evaluation Step	# Verified
Simulation re-run (H2K) and compared to tracking, verified if ± 2%	30
Output files for (XLS) compared to tracking, verified if ± 2%	0
Additional Explanation request	0
Comparison to output file values	0
Total Verified	**30**

The gross savings realization rate is 100.00%, shown in Table 11-72.

Table 11-72. Enbridge Home Winterproofing realization rate

Numbers of Houses	Realization Rate	90% Confidence Interval			
		Absolute Precision	Lower Bound	Upper Bound	Relative Precision
30	100.00%	0.00%	100.00%	100.00%	0.00%

Prescriptive Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. The EC certified the tracked savings which resulted in a savings ratio of 100.00%, as shown in Table 11-73.

Table 11-73. Enbridge scorecard achievements (cumulative savings) by measure group*

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Faucet Aerator	781	19,079	19,079	100.00%
Showerhead	429	106,098	106,098	100.00%
Thermostat	1,913	5,330,535	5,330,535	100.00%
TOTAL	**3,123**	**5,455,712**	**5,455,712**	**100.00%**

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC confirms the savings of 26,443,935 CCM (100.00% of tracked) for Enbridge's Home Winterproofing program.

11.6.3 Winter Retrofit – Home Weatherization – Union

Overview

Table 11-74 shows the tracked and verified scorecard achievements for the 2021 Union Home Weatherization Program, with the metric of CCM savings. As a result of this review, the EC verifies 45,903,844 CCM (103.88% of tracked). Table 11-74 includes the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-74. Union Low Income achievements: Home Weatherization CCM metrics*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM – Prescriptive	6,488,682	6,488,682	100.00%
CCM - Whole Home	37,700,583	39,415,162	104.55%
TOTAL	**44,189,264**	**45,903,844**	**103.88%**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-75 to verify the metrics for the Home Weatherization program.

Table 11-75. Documentation used to verify the Home Weatherization program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Project Files	Various documents for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0
Low Income Kits Verification Study	Final Report Following an Audit of the Union Gas ESK - Helping Homes Conserve – HHC – Program, Beslin Communication Group, March 15, 2013

Simulation-based Savings

Participant Selection

Union provided the tracking file, listing 1,673 individual participant homes in the Home Winterproofing program. To certify the scorecard metric, the EC identified individual sites within Private and Social Housing and randomly selected 30 participants for review, requested additional documentation, confirmed receipt of the correct files, and reviewed documents to verify participation and eligibility.

Received Files

The typical file folder had the following information:

- Photographs of pre- and post-installation conditions
- HOT2000 Model simulation Files (.h2k)
- HOT2000 Model Output Files (.xls)

Calculate Realization Rate

The EC used a multi-step process to verify tracked energy savings for the 30 sampled homes, shown in Figure 11-4 for the Home Weatherization program. The process was necessary because the simulation mode (EnerGuide or Expert[72]) used by program delivery agents is not available to non-certified professionals. While the EC can attempt to run the Expert simulations in General mode, the runs may produce error warnings or result in a savings differential between the Expert result and General result. Therefore, this multi-step process was developed to verify savings:

- EC requested simulation (H2K) and output (XLS) files from the program
- Where possible, the simulation file was re-run and the results used to verify the tracking savings. If different simulation versions or modes were used, the savings could be slightly different; therefore, simulation savings were considered "verified" if they were within 2% of the tracking savings; in this case, the tracked savings value was accepted as the verified savings.
- If a simulation file was not provided, the file inputs were incompatible with General mode and would not run, the file ran but produced an error due to version or mode differences, or the file produced a difference in savings greater than 2%, the output file was used to verify the tracking savings. As with the simulation file, the EC accepted tracking savings values within 2% of the output file value as the verified savings.
- If the EC was unable to verify the tracking savings against the output file, the EC requested additional documentation from the program (utility) to explain the discrepancy.
- If no additional documentation or explanation was available, the EC compared output file values to project documentation to determine if the calculated model values were consistent with documentation. If they were not consistent, the output file value was used as the verified value.

Figure 11-4. Overview of gross savings verification for 2021 Home Weatherization program

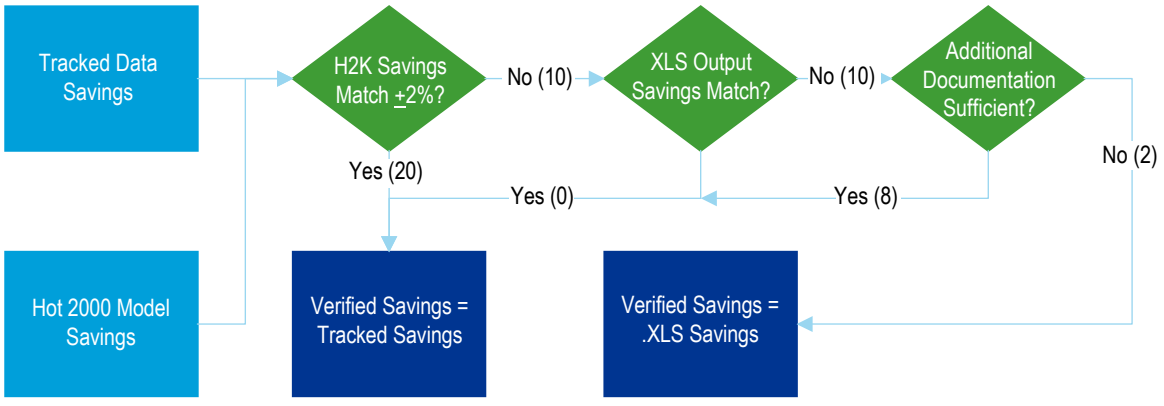


Table 11-76 shows how many customers were verified in each evaluation step. Savings for 30 homes were verified with comparison of tracking data against either simulation (H2K) or output (XLS) files.

[72] "Expert" is the mode listed in the output files. This mode is also labelled as "EnerGuide" in simulation files. The EC uses both terms.

Table 11-76. Overview of gross simulation savings verification

Evaluation Step	# Verified
Simulation re-run (H2K) and compared to tracking, verified if ± 2%	20
Output files for (XLS) compared to tracking, verified if ± 2%	0
Additional Explanation request	8
Comparison to output file values	2
Total Verified	**30**

The gross savings realization rate (RR) is 104.55%, shown in Table 11-77.

Table 11-77. Union Home Weatherization realization rate

Numbers of Houses	Realization Rate	90% Confidence Interval			
		Absolute Precision	Lower Bound	Upper Bound	Relative Precision
30	104.55%	4.72%	99.83%	109.27%	7.10%

Prescriptive Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. The EC certified the tracked savings which resulted in a savings ratio of 100.00%, as shown in Table 11-78.

Table 11-78. Union scorecard achievements by measure group*

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Faucet Aerator	440	33,444	33,444	100.00%
Pipe Insulation	299	99,563	99,563	100.00%
Showerhead	217	48,405	48,405	100.00%
Thermostat	2376	6,307,270	6,307,270	100.00%
TOTAL	**3,332**	**6,488,682**	**6,488,682**	**100.00%**

*Not all values may compute exactly due to rounding.

Verification Result

As a result of this review, the EC confirms the savings of 45,903,844 CCM (103.88% of tracked) for Union's Home Weatherization program.

11.6.4 Winter Retrofit – Indigenous Program – Union

No activity was reported for this program in 2021.

11.6.5 Low Income New Construction – Enbridge

Overview

Table 11-79 shows the tracked and verified scorecard achievements for the 2021 Enbridge Low Income New Construction Program, with the metric of participants. As a result of this review, the EC verifies 13 participants (100.00% of tracked). Table 11-79 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-79. Enbridge Low Income achievement: New Construction participants metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Participants	13	13	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-80 to verify the metrics for the Low Income New Construction (LINC) program.

Table 11-80. Documentation used to verify the Low Income New Construction program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	PDF document for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
Enbridge's Draft 2021 Report	Enbridge Gas Inc. DRAFT 2021 Demand Side Management Annual Report

Participant Selection

Enbridge first provided the Tracking file listing Program Year, Project Code (unique ID), Participant Status, Application Date, Charrette Date, and IDP Report Receipt. The spreadsheet listed thirteen individual participants. The EC requested full documentation for all participants.

Received Files

Enbridge provided the EC with document folders identified by LINC Project number and containing project PDF documents. The EC first confirmed the folders received matched the IDs requested from the Tracking file. The EC confirmed that documents for all participants had been received.

Verify Participation

The metric for the program is participants. To determine the definition of participant, the EC looked first to the OEB Decision, which identified a participant as someone who submits a Project Application.[73]

The OEB Decision also includes the Enbridge proposed metric of "New Construction Program Participants."[74] This label differs slightly from "Number of Project Applications," and implies a second or additional definition for the metric. To identify if a record with a submitted a project application qualifies as a participant, the EC also reviewed the program description:[75]

> *"Enbridge's proposed low-income new construction program will provide home builders with workshops, energy efficiency modelling tools, design options, energy efficiency education and financial incentives related to new affordable housing new construction developments."*

From this, the EC determined that to demonstrate *participation*, Project Files should also provide documentation for *any* of the following:

- Workshop participation
- Energy efficiency modelling tools
- Design options
- Energy efficiency education
- Financial incentives

The EC evaluated the sampled participant files against the criteria above and determined that all thirteen projects qualify as participants.

Verify Eligibility

The OEB Decision does not provide a clear definition for participant eligibility, instead pointing to approval of Enbridge's Plan. From the Plan, the EC found the following eligibility requirements:

- Submitted project application
- New affordable housing qualified by a municipal, provincial and/or federal housing program.
- Application identifies the project is specifically directed to affordable building developments, either single family (Part 9) or multi-residential (Part 3)

These criteria were based on an examination of the 2016-2020 offer descriptions and Enbridge's Plan (Table 11-81).

[73] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, p. 64-65, 67, 78, and Schedule C
[74] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Schedule B
[75] Ibid, p. 30

Table 11-81. Eligibility requirements documentation

Document	Relevant Contents
2016-2020 OFFER DESCRIPTIONS[76]	*"The offer is specifically directed to residential and multi-residential affordable building developments and efforts will focus on working with and through municipal governments, private and non-profit local housing corporations."*
EVALUATION PLAN[77]	• *Developers and builders of new "affordable housing" as qualified by a municipal, provincial and/or federal housing program.* • *Developers and builders of both singe (sic) family Part 9 houses and multi-residential Part 3 buildings are eligible to participate.*
Draft 2021 Report[78]	*Eligibility criteria consists of the following:* • *New construction project must be located within the EGD rate zone; and,* • *The project proponent must have been recognized as a builder or provider of affordable housing by a municipal, provincial, and/or federal body, by virtue of receiving financial assistance, in the present or at any time in the past, from a government program aimed at affordable housing.*

To confirm eligibility, the EC looked for documentation that indicates the development or project is specifically directed to affordable building developments, either single family (Part 9) or multi-residential (Part 3). Project Files did contain identification of projects as Part 3 or Part 9 projects. Additionally, project files for all participants indicated that each development qualified as affordable housing.

Verification Result

As a result of this review, the EC confirms that all projects meet the definition and eligibility requirements, resulting in a scorecard achievement of 13 participants (100.00% of tracked) for Enbridge's Low Income New Construction program.

[76] Enbridge's Proposed 2015-2020 DSM Plan, EB-2015-0049, Exhibit B, Tab 2, Schedule 1, page 45 of 100
[77] Enbridge's Proposed 2015-2020 DSM Plan, EB-2015-0049, Exhibit B, Tab 2, Schedule 2, page 31 of 55
[78] Enbridge Gas Inc. Draft 2021 Demand Side Management Annual Report, April 1, 2021, page 98

11.6.6 Low Income Multi-Residential – Affordable Housing Program – Enbridge

Overview

Table 11-82 shows the tracked and verified scorecard achievements for the 2021 Enbridge Affordable Housing Program, with the metric of CCM savings. As a result of this review, the EC verifies 88,304,418 CCM for all program measures (100.00% of tracked). Table 11-82 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-82. Enbridge Low Income achievements: Low Income Multi-Residential CCM metrics*

Metric	Achievement		Ratio
	Tracked	Verified	
Prescriptive CCM	1,263,000	1,263,000	100.00%
Custom CCM	87,041,418	87,041,418	100.00%
TOTAL	**88,304,418**	**88,304,418**	**100.00%**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-83 to verify the metrics for the Affordable Housing program.

Table 11-83. Documentation used to verify the Low Income Multi-Residential Program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0
2017-2018 CPSV Report	2018 Natural Gas Demand Side Management Custom Savings Verification[79,80]

Verify Prescriptive Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in Section 11.13. The EC made some minor changes to the tracked savings which resulted in a savings ratio of 100.00%, as shown in Table 11-84.

[79] 2017-2018 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, December 26, 2019

[80] The EC did not complete studies verifying the custom project savings (CPSV) during the 2019, 2020, or 2021 program years. Instead, the EC used the same adjustment factors resulting from custom projects implemented in the 2017 and 2018 program years, adjusted for the mix of projects installed in 2021.

Table 11-84. Enbridge - prescriptive measures - scorecard achievements by measure group*

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Make-Up Air Unit	3	1,263,000	1,263,000	100.00%
TOTAL	**3**	**1,263,000**	**1,263,000**	**100.00%**

*Not all values may compute exactly due to rounding.

Verify Custom Savings

The EC identified the custom savings totals from Enbridge Tracking Files shown in Table 11-85. The EC applied a realization rate from the 2017-2018 CPSV report for Multi-Residential of 121.09%.

Table 11-85. Enbridge - custom measures - scorecard achievements*

Measure Group	Installed Measures	Tracked Gross Savings (CCM)**	Verified Achievement (CCM)	Savings Ratio
20 Year Space (Space Heating)	20	30,049,820	36,387,327	121.09%
Boiler - Hydronic Condensing - Space Heating	27	15,028,381	18,197,867	121.09%
Boiler - Hydronic Condensing - Water Heating	19	3,257,340	3,944,313	121.09%
Boiler - Hydronic High Efficiency - Space Heating	10	10,104,427	12,235,451	121.09%
Boiler - Hydronic High Efficiency - Water Heating	4	1,155,797	1,399,555	121.09%
Controls - Space Heating	14	4,400,070	5,328,045	121.09%
Controls - Ventilation	21	7,248,945	8,777,748	121.09%
Controls - Water Heating	8	325,005	393,549	121.09%
Insulation - Tank - Water Heating	1	10,800	13,078	121.09%
Solar Wall - Ventilation	1	245,100	296,792	121.09%
Tank Type Water Heater	3	55,905	67,695	121.09%
TOTAL	**128**	**71,881,590**	**87,041,418**	**121.09%**

*Not all values may compute exactly due to rounding.
**This value represents savings in the tracking data before any adjustments were made. This differs from tracked net savings, which do account for adjustments.

Verification Result

As a result of this review, the EC confirms the total savings of 88,304,418 CCM (100.00% of tracked) for Enbridge's Affordable Housing Program.

11.6.7 Low Income Multi-Residential – Multifamily Program (SA) – Union

Overview

Table 11-86 shows the tracked and verified scorecard achievements for the 2021 Union Multifamily (Social and Assisted) Program, with the metric of CCM savings. As a result of this review, the EC verifies 9,535,480 CCM (100.00% of tracked). Table 11-86 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-86. Union Low Income achievements: Multifamily Program (SA) CCM metrics*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM - Prescriptive	3,986,383	3,986,383	100.00%
CCM - Custom	5,549,097	5,549,097	100.00%
TOTAL	**9,535,480**	**9,535,480**	**100.00%**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-87 to verify the metrics for the Multifamily (Social and Assisted) program.

Table 11-87. Documentation used to verify the Multifamily (Social and Assisted) program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0
2017-2018 CPSV Report	2018 Natural Gas Demand Side Management Custom Savings Verification[81,82]

Verify Prescriptive Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in 11.13. The EC certified the tracked savings which resulted in a savings ratio of 100.00%, as shown in Table 11-88.

[81] 2017-2018 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, December 26, 2019

[82] The EC did not complete studies verifying the custom project savings (CPSV) during the 2019, 2020, or 2021 program years. Instead, the EC used the same adjustment factors resulting from custom projects implemented in the 2017 and 2018 program years, adjusted for the mix of projects installed in 2021.

Table 11-88. Union - prescriptive measures - scorecard achievements by measure group*

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Energy Recovery Ventilation	6	1,069,880	1,069,880	100.00%
Heat Recovery Ventilation	1	1,617,030	1,617,030	100.00%
Make-Up Air Unit	6	1,277,199	1,277,199	100.00%
Water Heater	2	22,274	22,274	100.00%
TOTAL	**15**	**3,986,383**	**3,986,383**	**100.00%**

*Not all values may compute exactly due to rounding.

Verify Custom Savings

The EC identified the custom savings totals from Union Tracking Files shown in Table 11-89. The EC applied an attribution factor of 95.00%, which is the deemed attribution for Low Income Multi-Residential programs, and a realization rate from the 2017-2018 CPSV report for Multi-Residential of 90.57%.

Table 11-89. Union - custom measures - scorecard achievements*

Measure Group	Installed Measures	Tracked Gross Savings (CCM)**	Verified Achievement (CCM)	Savings Ratio
Air Handling Unit	1	14,655	12,609	86.04%
Condensing Boiler - Combo	1	577,168	496,604	86.04%
Condensing Boiler - DHW - Less than 300 MBH	5	292,488	251,661	86.04%
Condensing Boiler - DHW	2	178,634	153,699	86.04%
Condensing Boiler - Heating	7	1,825,923	1,571,051	86.04%
High Efficiency Boiler - DHW	1	77,658	66,818	86.04%
Make-Up Air Unit	4	280,935	241,721	86.04%
New Construction	4	1,054,621	907,412	86.04%
Pipe/Valve/Fitting Insulation	1	391,496	336,849	86.04%
Solar Wall	6	1,755,750	1,510,673	86.04%
TOTAL	**32**	**6,449,326**	**5,549,097**	**86.04%**

*Not all values may compute exactly due to rounding.
**This value represents savings in the tracking data before any adjustments were made. This differs from tracked net savings, which do account for adjustments.

Verification Result

As a result of this review, the EC confirms total savings of 9,535,480 CCM (100.00% of tracked) for Union's Multifamily (Social and Assisted) Program.

11.6.8 Low Income Multi-Residential – Multifamily Program (MR) – Union

Overview

Table 11-90 shows the tracked and verified scorecard achievements for the 2021 Union Multifamily (Market Rate) Program, with the metric of CCM savings. As a result of this review, the EC verifies 8,307,799 CCM for all program measures (100.00% of tracked). Table 11-90 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-90. Union Low Income achievements: Multifamily (MR) Program CCM metrics*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM - Prescriptive	300,899	300,899	100.00%
CCM - Custom	8,006,899	8,006,899	100.00%
TOTAL	**8,307,799**	**8,307,799**	**100.00%**

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-91 to verify the metrics for the Multifamily (Market Rate) program.

Table 11-91. Documentation used to verify the Multifamily (Market Rate) program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
TRM 5.0	Natural Gas Demand Side Management Technical Resource Manual, Version 5.0
2017-2018 CPSV Report	2018 Natural Gas Demand Side Management Custom Savings Verification[83,84]

Verify Prescriptive Savings

In calculating net CCM, the EC reviewed natural gas savings for prescriptive measures from the Tracking File, using the procedures identified in 11.13. The EC certified the tracked savings which resulted in a savings ratio of 100.00%, as shown in Table 11-92.

[83] 2017-2018 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, December 26, 2019

[84] The EC did not complete studies verifying the custom project savings (CPSV) during the 2019, 2020, or 2021 program years. Instead, the EC used the same adjustment factors resulting from custom projects implemented in the 2017 and 2018 program years, adjusted for the mix of projects installed in 2021.

Table 11-92. Union - prescriptive measures - scorecard achievements by measure group*

Measure Group	Installed Measures	Tracked Achievement (CCM)	Verified Achievement (CCM)	Savings Ratio
Energy Recovery Ventilation	2	300,899	300,899	100.00%
TOTAL	**2**	**300,899**	**300,899**	**100.00%**

*Not all values may compute exactly due to rounding.

Verify Custom Savings

The EC identified the custom savings totals from Union Tracking Files shown in Table 11-93. The EC applied an attribution factor of 95.00%, which is the deemed attribution for Low Income Multi-Residential programs, and a realization rate from the 2017-2018 CPSV report for Multi-Residential of 90.57%.

Table 11-93. Union - custom measures - scorecard achievements*

Measure Group	Installed Measures	Tracked Gross Savings (CCM)**	Verified Achievement (CCM)	Savings Ratio
Air Handling Unit	1	25,215	21,695	86.04%
Condensing Boiler - Combination	3	2,565,140	2,207,085	86.04%
Condensing Boiler - DHW	2	223,935	192,677	86.04%
Condensing Boiler - Heating	3	432,283	371,942	86.04%
Boiler - Heating	2	96,840	83,323	86.04%
High Efficiency Boiler - DHW	1	405,800	349,156	86.04%
High Efficiency Boiler - Heating	2	1,872,375	1,611,020	86.04%
Building Automation	10	3,418,155	2,941,032	86.04%
Reflective Panel	2	266,115	228,969	86.04%
TOTAL	**26**	**9,305,858**	**8,006,899**	**86.04%**

*Not all values may compute exactly due to rounding.
**This value represents savings in the tracking data before any adjustments were made. This differs from tracked net savings, which do account for adjustments.

Verification Result

As a result of this review, the EC confirms total savings of 8,307,799 CCM (100.00% of tracked) for Union's Multifamily (Market Rate) Program.

11.7 Appendix G: Large Volume Scorecard

This appendix describes the detailed process used to verify the metrics for the Large Volume Scorecard programs for Union, shown in Table 11-94. The program addressed in this appendix is the Large Volume program.

Table 11-94. Union 2021 Large Volume (Rate T2/Rate 100) program scorecard*

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
Large Volume	CCM	141,733,709	141,733,709	87,077,474	116,103,299	174,154,948	100.00%

Overview

Table 11-95 shows the tracked and verified scorecard achievements for the 2021 Union Large Volume program, with the metric of CCM savings. As a result of this review, the EC verifies 141,733,709 CCM for all program measures (100% of tracked). Table 11-95 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-95. Union Large Volume achievement: Large Volume CCM metrics*

Metric	Achievement		Ratio
	Tracked	Verified	
CCM - Prescriptive	-	-	-
CCM - Custom	141,733,709	141,733,709	100.00%
Total	**141,733,709**	**141,733,709**	**100.00%**

*Not all values may compute exactly due to rounding.

Table 11-96 includes these variables:

- Tracking Gross Savings: Gross cumulative tracking savings for all customers in the Union Large Volume program.
- RR: Gross realization rate from the 2017-2018 CSPV report.
- Att: Attribution ratio (the complement of free ridership) from the 2018 NTG report.
- Spillover: Spillover ratio from 2013-2014 Spillover Study.
- Adj: Adjustment Ratio, the product of the RR and the sum of the Att ratio and Spillover ratio

Equation 11: Adjustment Ratio

$$\boldsymbol{Adjustment\ Ratio = RR * (Att + Spillover)}$$

- Verified Net Savings: Cumulative gross savings multiplied by the Adjustment Ratio

Equation 12: Verified Net Savings

$$Verified\ Net\ Savings = Adjustment\ Ratio * (Cumulative\ Gross)$$

Table 11-96. Adjustment factors applied to Large Volume Program cumulative gross savings*

Measure Type	Tracking Gross Savings (CCM)**	RR (%)	Att (%)	Spillover (%)	Adj* (%)	Verified Net Savings (CCM)
Prescriptive	-	-	-	-	-	-
Custom	1,023,390,495	90.46%	14.49%	0.82%	13.85%	141,733,709
TOTAL	**1,023,390,495**					**141,733,709**

*Not all values may compute exactly due to rounding.
**This value represents savings in the tracking data before any adjustments were made. This differs from tracked net savings, which do account for adjustments.

Documentation

The EC used the documentation shown in Table 11-97 to verify the metrics for the Large Volume program.

Table 11-97. Documentation used to verify the Large Volume program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
Union's Draft 2021 Report	Union Gas 2021 Demand Side Management Draft Annual Report[85]
2017-2018 CPSV Report	2018 Natural Gas Demand Side Management Custom Savings Verification[86]
2018 NTG Report	2018 Natural Gas Demand Side Management Free-ridership Evaluation[87,88]
2013-2014 Spillover Study	CPSV Participant Spillover Results[89]

Custom Savings

The EC identified 43 tracked custom measures with tracked cumulative gross savings of 1,023,390,495 CCM. These projects are grouped by measure in Table 11-98.

Table 11-98. Union - custom measures – verified cumulative gross savings by measure group*

Measure Group	Installed Measures	Tracking Gross Savings (CCM)
Furnace or Dryer	14	377,062,881
HVAC	5	39,597,815
Productivity Improvement	1	62,935,080
Steam or Hot Water System	23	543,794,719
TOTAL	**43**	**1,023,390,495**

*Not all values may compute exactly due to rounding.

[85] While the EC recognizes that the draft report will be updated and finalized, the final was not available at the time of this evaluation, thus the draft is cited for reference.
[86] 2017-2018 Natural Gas Demand Side Management Custom Savings Verification, DNV for the Ontario Energy Board, December 26, 2019
[87] 2018 Natural Gas Demand Side Management Free-ridership Evaluation, DNV for the Ontario Energy Board, December 27, 2019
[88] The EC did not complete studies verifying the custom project savings (CPSV) during the 2019, 2020, or 2021 program years. Instead, the EC used the same adjustment factors resulting from custom projects implemented in the 2017 and 2018 program years, adjusted for the mix of projects installed in 2021.
[89] CPSV Participant Spillover Results, DNV for the Ontario Energy Board, May 23, 2018

Adjustment Values – RR

The 2017-2018 CPSV Report conveyed one gross realization rate for the program, 90.46%.

Adjustment Values – Att Ratios

The 2017-2018 CPSV Report conveyed one attribution ratio for the program, 14.49%.

Adjustment Values – Spillover Ratios

The 2013-2014 Spillover Study conveyed one spillover ratios for the program, 0.82%.

Verify Cumulative Natural Gas Savings

The EC calculated the measure-level net savings using Equation 11 and Equation 12, then summed the measure-level savings to produce program-level savings. The EC calculated the program-level adjustment ratio by dividing the program-level net savings by the program-level gross savings.

Table 11-99. 2021 Large Volume measure groups adjustment values and cumulative net savings*

Measure Type	Tracking Gross Savings (CCM)	RR (%)	Att (%)	Spillover (%)	Adj* (%)	Verified Net Savings (CCM)
Custom	1,023,390,495	90.46%	14.49%	0.82%	13.85%	141,733,709

*Not all values may compute exactly due to rounding.
†Adjustment value displayed is truncated (2 digit) average based on sum of all individual adjustments by measure. Individual adjustment factors (RR, ATT, Spillover) are utilized for calculations at the two-digit level, as displayed.

Verification Result

As a result of this review, the EC confirms total savings of 141,733,709 CCM (100% of net tracked) for Union's Large Volume (Rate T2/Rate 100) Program.

11.8 Appendix H: Market Transformation Scorecards

This appendix describes the detailed process used to verify the metrics for the Market Transformation Scorecard programs for Enbridge (Table 11-100) and Union (Table 11-101). The programs addressed in this appendix are:

- Commercial New Construction – Commercial Savings by Design – Enbridge
- Commercial New Construction – Union
- Residential New Construction – Residential Savings by Design – Enbridge
- Residential New Construction – Optimum Home Program – Union
- School Energy Competition – Enbridge

Table 11-100. Enbridge 2021 market transformation scorecard[90]†

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
Run it Right	Participants	36	36	87	116	175	20.00%
Comprehensive Energy Management	Participants	2	2	22	29	44	20.00%
Residential Savings by Design	Builders	24	24	29	39	59	10.00%
Residential Savings by Design	Homes Built	2,514	2,514	2,329	3,105	4,658	15.00%
School Energy Competition	Schools	-	-	44	58	87	10.00%
Commercial Savings by Design	New Developments	17	17	28	37	56	25.00%

†Programs in grey text are not similar to Union programs under the Market Transformation Scorecard, and not discussed in this Appendix. For these programs, please refer to Section 11.9.

Table 11-101. Union 2021 market transformation scorecard[91]

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
Optimum Home	Percentage of Homes Built	73.08%	73.08%	45.66%	60.88%	91.33%	50.00%
Commercial New Construction	New Developments	24	24	19	25	38	50.00%

[90] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Schedule C
[91] Ibid

11.8.1 Commercial New Construction – Commercial Savings by Design – Enbridge

Overview

Table 11-102 shows the tracked and verified scorecard achievements for the 2021 Enbridge Commercial Savings by Design (SBD) Program, with the metric of New Developments. As a result of this review, the EC verifies 17 New Developments (100.00% of tracked). Table 11-102 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-102. Enbridge Market Transformation achievement: Commercial Savings by Design developments metric*

Metric	Achievement		Ratio
	Tracked	Verified	
New Developments	17	17	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-103 to verify the metrics for the Commercial Savings by Design program.

Table 11-103. Documentation used to verify the Commercial Savings by Design program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	PDF documents
Confirmation Emails	PDF copies of email correspondence with builders verifying aspects of their housing developments
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049

Participant Selection

Enbridge provided the Tracking File listing Project Number (unique ID), program year, commitment date, and IDP date. As tracking data indicated that all 17 listed participants were equally qualified, the EC randomly selected 10 records from the full list for document review. The EC requested all supporting documentation, including documentation that supports eligibility and participation criteria.

Received Files

The EC received two types of documents in response to this request:

- Commitment form, including terms and conditions
- IDP report

The EC first confirmed that the documentation received matched the IDs requested. The EC confirmed that the signature dates on the commitment form matched the commitment date in the tracking file, and that the date on the IDP report matched the date recorded in the IDP date field of the tracking file.

Verify Participation

To determine the definition of New Developments, the EC looked first to the OEB Decision, which approved the Enbridge ESC Plan:[92]

Decisions
The OEB approves Enbridge's Commercial Savings by Design program. This program is similar to Enbridge's Residential Savings by Design, with the difference being the target market is commercial and industrial buildings as opposed to residential new construction. For the same reasons as the Residential Savings by Design program, the OEB finds that this program is consistent with guiding principles of the DSM Framework and drives integrated conservation savings prior to building construction.

Relevant criteria for "new development" are described in Enbridge's Plan "Budgets, Metrics and Targets,"[93] paragraph 46:

- For the purpose of assessing the "new developments enrolled" metric for SBD Commercial:

  i. *Only builders and developers who have "enrolled" in the program and completed the IDP process are eligible to be counted towards the target.*

  ii. "Enrolment" is defined as a signed MOU with a builder or developer containing a commitment to participate in the Enbridge Commercial Savings by Design offer for a 5-year period which will include undertaking an IDP adhering to an Enbridge approved IDP process (such as IEA Task 23 or the iiSBE developed IDP Tool) which also includes the requisite energy model, demonstrating how to achieve at least 15% total energy savings relative to the yet to be completed 2017 Ontario Building Code. The builder must also commit to constructing buildings or a building to the IDP standard within 5 years.

  iii. The metric in the Commercial Savings by Design scorecard is based on the number of projects to which a developer commits, i.e., the same developer with different clients and different kinds of projects may be counted multiple times. A minimum 50,000 square feet requirement applies to each project. A project is defined as either a single building or multiples of the same building by the same company that add up to 50,000 square feet.

From these definitions, the EC observed the following criteria:

- Only projects from enrolled builders/developers count towards the metric. Enrollment is defined as:
  - A builder or developer committed to the CSBD offer for five years via an MOU
  - And undertaking the Enbridge approved IDP process for each development, which requires:
    - Energy model
    - Demonstration of how to achieve 15% energy savings over 2017 building code
    - A project which is a single building or multiples of the same building which sum to at least 50,000 ft^2

The EC noted that the IDPs submitted for the 10 developments cited an average savings of 32% improvement against the 2017 OBC code, with a range of 15.5% to 42.7% savings. The average square footage was 177,532 ft^2 with a range of 75,927 ft^2 to 273,916 ft^2.

[92] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Page 39
[93] Enbridge's Proposed 2015-2020 DSM Plan, EB-2015-0049, Exhibit B, Tab 1, Schedule 4, 37 of 41

Table 11-104. Enbridge Commercial Savings by Design participation criteria, project satisfaction, and explanation

Identified Criteria	Satisfied?	Explanation
Only projects from enrolled builders/developers count towards the metric	Yes	Following criteria meet definition for enrolment
Enrolment is defined as builder or developer committed to the CSBD offer for five years	Yes	Terms and Conditions establishes that project must be completed within 5 years
Undertaking Enbridge approved IDP process for each development	Yes	IDP Reports included in documentation
IDP includes energy model	Yes	IDP Reports identifies eQuest v3.65[94]
Sufficient energy savings achieved	Yes	See below
-IDP demonstrates how to achieve 15% energy savings over 2017 building code	N/A	All IDP reports states savings 15% over 2017 OBC
Project must be at least 50,000 ft^2	Yes	Applications and IDP Reports included in documentation
Project is a single building or multiples of same building which sum to at least 50,000 ft^2	Yes	Projects of one or multiple buildings all greater than 50,000 ft^2

As a result, the EC confirms that the submitted projects met the criteria for participation as a New Development for the Enbridge Commercial Savings by Design program.

Verify Eligibility

Enbridge's Plan, approved by the OEB, further identifies eligibility criteria. As stated in Enbridge's Plan:[95]

> *The SBD Commercial offer is direct-to-builder/developer delivered by an internal sales team. Eligibility criteria include the following:*
> - *Commercial, multi-residential or industrial buildings covered under the Ontario Building Code Part 3;*
> - *A minimum threshold of 50,000 square feet per project (including aggregate multi-location projects);*
> - *Building(s) must be within Enbridge's franchise area, or for aggregate projects 75% of the project square footage must be in the franchise area;*
> - *Building(s) must be in the design phase or earlier in the process;*
> - *Building construction must be completed within five years of signing the agreement, and commissioning must be completed no more than one year after that; and,*
> - *Builders will be eligible to participate in the offer multiple times for different projects*

These defined eligibility requirements overlap with the criteria Enbridge laid out for assessing enrolments. The EC used the Commitment Forms and IDP Reports to determine if the projects met these criteria.

[94] ASHRAE 90.1-2013 section 11 as modified by Supplementary Standard SB10-2017 Division 3, Chapter 2, were followed in generating reference and baseline models

[95] Enbridge's Proposed 2015-2020 DSM Plan, EB-2015-0049, Exhibit B, Tab 2, Schedule 1, 61 of 100

Table 11-105. Enbridge Commercial Savings by Design eligibility criteria, project satisfaction, and explanation

Identified Criteria	Satisfied?	Explanation
Commercial, multi-residential or industrial buildings	Yes	IDP Reports
50,000 ft^2 minimum project size	Yes	Commitment Form
Within Enbridge territory	Yes	Application terms and conditions
Design phase or earlier	Yes	IDPs performed to prior to construction.
Construction within 5 years	N/A	Eligibility for fuller program participation, not applicable for new enrolment.
Commissioning within 1 year of construction	N/A	

After reviewing the stated eligibility criteria and Project Files, the EC confirms the 10 sampled projects all meet the eligibility criteria.

Verification Result

As a result of this review:

- The EC confirms proper documentation for the requested projects
- Project files for the submitted projects meet all requirements for a participant
- Project files for the submitted projects meet further criteria for eligibility

As a result of this review, the EC confirms the scorecard metric of 17 new developments (100.00% of tracked) for the Enbridge Commercial Savings by Design program.

11.8.2 Commercial New Construction – Union

Overview

Table 11-106 shows the tracked and verified scorecard achievements for the 2021 Union Commercial New Construction Program (also referred to as the Commercial Savings by Design Program), with the metric of New Developments. As a result of this review, the EC verifies 24 New Developments enrolled by participating builders (100.00% of tracked). Table 11-106 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-106. Union Market Transformation achievement: Commercial New Construction developments metric*

Metric	Achievement		Ratio
	Tracked	Verified	
New Developments	24	24	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-107 to verify the metrics for the Commercial New Construction program.

Table 11-107. Documentation used to verify the Commercial New Construction program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Project Files	Various documents for each requested participant, supporting program metrics
Confirmation Emails	PDF copies of email correspondence with builders verifying aspects of their housing developments
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029

Participant Selection

Union provided the Tracking File listing Project Code (unique ID), program year, application date, Visioning Date, and IDP date. The spreadsheet identified 24 participants, all with 2021 dates. As tracking data indicated that all the 24 listed participants were equally qualified, the EC requested all supporting documentation for 10 developments, including documentation that supports eligibility and participation criteria.

Received Files

The EC received four types of documents in response to this request:

- Commitment form
- Terms and Conditions
- IDP report

- Supporting Letter

The EC first confirmed that the documents received matched the IDs requested. The EC confirmed that the signature dates on the commitment form matched the commitment date in the tracking file, and that the date on the IDP report matched the date recorded in the IDP date field of the tracking file.

Verify Participation

To determine the definition of New Developments, the EC looked first to the OEB Decision, which approved Union's Plan:[96]

Decisions
The OEB approves Enbridge's Commercial Savings by Design program. This program is similar to Enbridge's Residential Savings by Design, with the difference being the target market is commercial and industrial buildings as opposed to residential new construction. For the same reasons as the Residential Savings by Design program, the OEB finds that this program is consistent with guiding principles of the DSM Framework and drives integrated conservation savings prior to building construction.
The OEB directs Union to establish a similar program targeting commercial and industrial buildings in its service area. The OEB finds commercial and industrial customers would expect consistency in the market, especially for province-wide chains, franchises and companies.

Relevant criteria for "new development" are described in Union's Draft report:[97]

To be eligible for an incentive, the submitted projects must fulfill the following criteria:

- *Construction projects must have a minimum threshold of 50,000 square feet per project (including aggregate multi-location projects)*
- *Building(s) must be in the design phase or earlier*
- *Building construction must be completed within 5 years of completion of the IDP, and building must be commissioned within 1 year of construction completion*
- *Builders are eligible to participate in the offering multiple times for different projects*

From these definitions, the EC observed the following criteria:

- Only projects from enrolled builders/developers count towards the metric. Enrolment is defined as:
  - A builder or developer committed to the program offer for five years via an MOU
  - And undertaking the Union approved IDP process for each development, which requires:
    - Energy model
    - Demonstration of how to achieve 15% energy savings over 2017 building code
    - A project is a building or multiples of same building which sum to at least 50,000 ft^2

The EC noted that the IDPs submitted for 10 sampled participants cited an average savings of 38.11% improvement against the 2017 OBC code, with a range of 15% to 115.9%[98] in savings. Upon initial review, IDPs for 9 of the 10 developments showed at least 50,000 ft^2 with an average of 164,702 ft^2 and a range of 42,701 ft^2 to 400,963 ft^2. Therefore, one development initially did not qualify on the basis of being smaller than 50,000 ft^2. However, Union provided the EC with a supporting letter from the builder confirming the developments would in fact exceed 50,000 ft^2.

[96] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Page 39
[97] Union's DRAFT 2021 Demand Side Management Evaluation Report, Page 110
[98] The development with 115.9% savings achieved included a solar energy system, which resulted in the modelled building producing more energy than it would consume on an annual basis.

Table 11-108. Union Commercial New Construction participation criteria, project satisfaction, and explanation

Identified Criteria	Satisfied?	Explanation
Only projects from enrolled builders/developers count towards the metric	Yes	Following criteria meet definition for enrolment
Enrolment is defined as builder or developer committed to the CSBD offer for five years:	Yes	Terms and Conditions establishes that project must be completed within 5 years
Undertaking IDP process for each development	Yes	IDP Reports included in documentation
IDP includes energy model	Yes	IDP Reports identify eQuest v3.65[99]
Sufficient energy savings achieved	Yes	See below
- IDP demonstrates how to achieve 15% energy savings over 2017 code	N/A	All IDP reports state savings 15% over 2017 OBC
Project must be at least 50,000 ft^2	Yes	Commitment Forms and supporting letters
Project is a single building or multiples of same building which sum to at least 50,000 ft^2	Yes	Projects of one or multiple buildings all greater than 50,000 ft^2

As a result, the EC confirms that the submitted projects met the criteria for participation as a New Development for the Union Commercial New Construction program.

Verify Eligibility

Since Union's plan was submitted before the Decision and Order that instructed Union to create a similar program to Enbridge's, the earlier referenced draft report served as the primary reference for eligibility. The EC used the Commitment Forms and IDP Reports to determine if the projects met these criteria.

Table 11-109. Union Commercial New Construction eligibility criteria, project satisfaction, and explanation

Identified Criteria	Satisfied?	Explanation
Commercial, multi-residential or industrial buildings	Yes	IDP Reports
50,000 ft^2 minimum project size	Yes	Commitment Forms and supporting letters
Design phase or earlier	Yes	IDPs performed to prior to construction.
Construction within 5 years	N/A	Eligibility for fuller program participation, not applicable for new enrolment.
Commissioning within 1 year of construction	N/A	

After reviewing these stated eligibility criteria and Project Files, the EC confirms that all 10 projects meet the eligibility criteria.

Verification Result

As a result of this review:

- The EC confirms proper documentation for the requested projects
- Project files for 10 of the submitted projects meet all requirements for a participant
- Project files for 10 of those projects meet further criteria for eligibility

The EC verifies the achievement of 24 projects (100.00% of tracked) for the Union Commercial New Construction program.

[99] ASHRAE 90.1-2013 section 11 as modified by Supplementary Standard SB10-2017 Division 3, Chapter 2, were followed in generating reference and baseline models

11.8.3 Residential New Construction – Residential Savings by Design – Enbridge

Overview

Table 11-110 shows the tracked and verified scorecard achievements for the 2021 Enbridge Residential Savings by Design (SBD) Program, with the metrics of enrolled builders and number of homes built. As a result of this review, the EC verifies 24 builders (100.00% of tracked) and 2,514 homes built (100.00% of tracked). Each metric is discussed separately in this section, starting with the builders metric. Table 11-110 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-110. Enbridge Market Transformation achievement: Residential Savings by Design metrics*

Program	Metric	Achievement		Ratio
		Tracked	Verified	
Residential Savings by Design	Builders	24	24	100.00%
	Homes Built	2,514	2,514	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-111 to verify the metrics for the Residential Savings by Design program.

Table 11-111. Documentation used to verify the Residential Savings by Design program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	Files documenting participation and eligibility for selected builder/project
Confirmation Emails	PDF copies of email correspondence with builders verifying aspects of their housing developments
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049

Builders Metric

Participant Selection

Enbridge first provided the Tracking File listing Project Number (unique ID), Enrolment Year, Signed Commitment (date), and IDP date. The spreadsheet identified 24 builders, all with 2021 IDP dates. As tracking data indicated that all the 24 listed builders were equally qualified, the EC randomly selected 10 from the full list for document review. The EC requested all supporting documentation, including documentation that supports eligibility and participation criteria.

Received Files

Enbridge provided three types of files to support participation:

- “Project Application”
- “IDP Report”

- Letters from participants supporting participation criteria

Verify Participation

To determine the definition of Enrolled Builders, the EC looked first to the OEB Decision, which approved the Enbridge ESC Plan[100] stating: "*The OEB approves Enbridge's Residential Savings by Design program as proposed."* For further detail on criteria, the EC looked to Enbridge's Plan which identified:[101]

> *"For the purpose of assessing whether a builder is "enrolled" in SBD Residential:*
>
> *i. The builder must have signed a Memorandum of Understanding ("MOU") containing a commitment to participate in the Residential SBD program for a 3-year period*
>
> *ii. The builder must have completed a program-approved Integrated Design Process ("IDP"), such as IEA Task 23 or the iiSBE developed IDP tool, including requisite energy modelling for homes the builder plans to construct in a new development. Homes to be completed in 2016 must demonstrate at least 25% total energy savings relative to the 2012 Ontario Building Code. Homes to be completed in 2018 and beyond must demonstrate total energy savings of at least 15% relative to the yet to be developed 2018 Ontario Building Code.*
>
> *iii. Builders will be permitted to enroll in Enbridge's Residential SBD offer more than once to avoid lost opportunities. In order to increase the scale of energy efficiency amongst participating builders, repeat builders will be offered progressively smaller incentives per home, but shall be permitted to collect these reduced incentives for a larger number of units.*
>
> *iv. In order for a builder's development to qualify as significant enough in size to participate in Enbridge's SBD Residential offer, the development must include no less than 50 homes."*

The EC evaluated the sampled participant files against the criteria above and determined:

- Requirement i:
  - Section 2c. of the Enbridge-provided Terms & Conditions included in the application contains the following: "…Applicant must design and construct the residential homes…by no later than three (3) calendar years from the date of the IDP."
  - This identifies an agreement to complete a project within three years but does not indicate the commitment of a builder to participate in the Residential SBD program for three years.
- Requirement ii:
  - Section 2c. of the Enbridge-provided Terms & Conditions includes the following: "In order to apply for the Program and be eligible for financial incentives, the Applicant must design and construct the residential homes…in Enbridge franchise areas which meet or exceed the Target Energy Performance", which is established in Section 1.ii as exceeding "the 2017 Ontario Building Code's ("OBC") energy performance requirements by at least 15% or greater."
  - All ten submitted IDP Reports identified at least 15% energy savings above 2017 OBC using the HOT2000 simulation program.
- Requirement iii:
  - The EC does not find that this requirement is applicable to validating participation, only that it permits further participation.
- Requirement iv:

[100] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Page 34
[101] Enbridge's Proposed 2015-2020 DSM Plan, EB-2015-0049, Exhibit B, Tab 1, Schedule 4, Page 35-36 of 41

– The Project Applications of all ten randomly selected builders identified the total development size of 50 homes or more, satisfying the requirement for no less than 50.

Verification Result

As a result, the EC confirms:

- Builders do not have MOUs identifying agreement to participate "in the Residential SBD program for three years," only that projects would be completed before three years are over
- All selected builders meet the participation criteria for IDP submission with sufficient savings
- All submitted builders meet the participation criteria for project size

As a result of this review, the EC confirms the scorecard metric of 24 enrolled builders (100.00% of tracked) for the Enbridge Residential Savings by Design program.

Homes Built Metric

Participant Selection

Enbridge first provided the Tracking File listing Project Code (unique ID), Builder, and Savings Percent over OBC for program homes. The spreadsheet identified 1,425 program-rebated homes, separate from the 1,089 additional homes built to program requirements but not receiving program rebates. The EC randomly selected five homes from the 1,425 program-rebated homes for document review. The EC requested all supporting documentation, including documentation that supports eligibility and participation criteria.

Received Files

Enbridge provided the following files to support the sampled homes:

- "Application Form" – PDF document outlining initial plans
- "IDP Workshop Report" – PDF document outlining qualification documentation
- "H2K Results" – JPG showing the Total Annual Fuel Consumption in megajoules (MJ) of the sampled house

In addition to these documents to support program homes, Enbridge also confirmed that supporting letters were received for additional non-rebated homes, verifying that they were built to the same IDP standard as program homes.

Verify Participation

To determine the definition criteria for Homes Built, the EC looked first to the OEB Decision, which approved the Enbridge ESC Plan stating[102] "*The OEB approves Enbridge's Residential Savings by Design program as proposed.*" For further detail on criteria, the EC looked to Enbridge's Plan which identified:[103]

> *For the purpose of assessing the "homes built" metric for SBD Residential:*
>
> *i. A home must be completed by a participating builder who has completed the IDP process for the development.*
>
> *ii. A home which, as constructed, has features consistent with the builder's IDP and that make it 25% more efficient than a new home built to the 2012 Ontario Building Code if constructed in 2016, and 15% more efficient than a new home built to the yet to be completed 2018 Ontario Building Code.*

[102] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, Page 34
[103] Enbridge's Proposed 2015-2020 DSM Plan, EB-2015-0049, Exhibit B, Tab 1, Schedule 4, Page 36-37 of 41

iii. Builders may apply the outcomes of the IDP to additional developments if the outcomes are applicable. The homes built in additional developments may be counted as homes built. However, the maximum number of homes for which a builder may receive incentives shall not increase.

iv. All homes constructed to the standard in a builder's development shall count towards the "homes built" metric even if rebates were not paid for all of them. Non-rebated units will be verified by a confirmation letter from the builder acknowledging that the homes were built to the IDP standard. Enbridge rebated units will be verified using the blower door test.

From this definition and submitted documentation, the EC determined participation for the randomly selected homes:

- Requirement i:
  - The EC did not evaluate whether the homes selected were completed by participating builders who had completed the IDP process for this development. Evaluation of the builders was done through verifying the Enrolled Builders metric (see above). The EC assumed that this portion of the requirements was met because the previous section confirmed builder participation.
- Requirement ii:
  - The Summary documentation as well as the Savings Summary worksheets, HOT2000 screenshots, and REM-Rate documents for all five randomly selected homes demonstrated modelled as-built energy consumption 15% or greater above 2017 OBC.
- Requirement iii:
  - The EC does not find that this requirement applies to validating participation, only that it permits further participation.
- Requirement iv:
  - Enbridge confirmed that supporting letters were received for all developments that included additional homes beyond those incentivized. The EC finds that this satisfies the requirement for non-rebated units.

The EC finds that all five randomly selected homes meet the eligibility and efficiency qualifications.

Verification Result

As a result of this review, the EC confirms 1,425 rebated program homes and 1,089 non-rebated homes, for an achievement of 2,514 Homes Built (100.00% of tracked) for the Enbridge Residential Savings by Design program.

11.8.4 Residential New Construction – Optimum Home Program – Union

Overview

Table 11-112 shows the tracked and verified scorecard achievements for the 2021 Union Optimum Home Program, with the metric of percentage of homes built (>15% above OBC 2017) by participating builders. As a result of this review, the EC verifies 73.08% of homes built (100.00% of tracked). Table 11-112 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-112. Union Market Transformation achievement: Optimum Home percentage of homes built metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Percentage of Homes Built	73.08%	73.08%	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-113 to verify the metrics for the Optimum Home program.

Table 11-113. Documentation used to verify the Optimum Home program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Union DSM programs
Optimum Home Top 10 and Homes Built List	Excel spreadsheet listing builders in each region by housing starts and all participating homes
Project Files	Various documents for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Union Plan	Union's 2015-2020 DSM Plan, EB-2015-0029
Union's Draft 2017 Report	Union Gas 2017 Demand Side Management Draft Annual Report

Participant Selection

Union first provided the Tracking File listing anonymized builders with the year each builder enrolled, the number of total new gas attachments in 2021, the number of program homes, and a percentage of homes built calculation. This file demonstrated the claimed metric achievement, identifying 1,352 of 1,850 total homes built by the 22 enrolled builders, as demonstrated in Table 11-114.

Table 11-114. Optimum Home claimed total and program homes built, by builder*

Builder	Total Homes Built	Optimum Homes Built	% of Homes Built
Builder 1	11	3	27.3%
Builder 2	133	132	99.2%
Builder 3	54	12	22.2%
Builder 4	806	806	100.0%
Builder 5	84	45	53.6%
Builder 6	97	40	41.2%
Builder 7	52	52	100.0%
Builder 8	0	0	0.0%
Builder 9	15	1	6.7%
Builder 10	2	0	0.0%
Builder 11	18	0	0.0%
Builder 12	0	0	0.0%
Builder 13	43	41	95.3%
Builder 14	0	0	0.0%
Builder 15	25	0	0.0%
Builder 16	13	0	0.0%
Builder 17	301	191	63.5%
Builder 18	0	0	0.0%
Builder 19	50	0	0.0%
Builder 20	2	0	0.0%
Builder 21	31	1	3.2%
Builder 22	113	28	24.8%
Total	**1,850**	**1,352**	**73.08%**

*Not all values may compute exactly due to rounding.

In addition, Union provided a list of Optimum Homes built in 2021 with individual listings for the 1,352 program homes, identifying builder, file number, and enrolment type (e.g., ES BOP Version 17). From these, the EC randomly selected five program homes for review and verification.

Union provided the following documentation to support verification of each of the selected program homes:

- Energy Star for New Homes Compliance Report – PDF
- Balance-of-Plant summary verifying building energy performance to ESNH v17

Verify Participation

This metric includes the percentage of homes built to Optimum Home energy performance standards "by participating builders." To fully verify the metric, the EC examined the builders of the randomly selected homes. The EC confirmed these builders enrolled in the program, satisfying the requirement.

Verify Eligibility

Union relaunched the Optimum Home program in 2017 in response to the introduction of the new Ontario Building Code (OBC) in 2017. To determine the definition of participating homes, the EC looked to the Union 2017 Draft Annual Report.

The report makes clear that qualifying homes constructed in 2017 and thereafter must “achieve ENERGY STAR® for New Homes v17 (“ESNH v17”).[104]

The EC requested documentation for verification of five sites, randomly selected from the 2021 Optimum Homes Built spreadsheet. Files provided by Union confirmed the eligibility of the homes. The ESNH v17 Compliance Report demonstrated both qualifying inspection dates (all 2021) and that the sites met the ESNH v17 energy performance threshold.

As a result, the EC confirms that the submitted projects meet the criteria for eligibility for the Union Optimum Homes program.

Verification Result

As a result of this review:

- The EC confirms proper documentation for the requested sites and builders
- Project files for the randomly selected sites meet energy savings compliance criteria

The EC verifies the scorecard metric of 1,352 out of 1,850 (73.08%) total participating builder homes (100.00% of tracked) for the Optimum Home program.

[104] Union’s Draft 2017 Demand Side Management Evaluation Report, Page 89

11.8.5 School Energy Competition – Enbridge

No activity was reported for this program in 2021.

11.9 Appendix I: Performance Based (Union) and Market Transformation (Enbridge) Scorecards

This appendix describes the detailed process used to verify the metrics for the Performance-Based Scorecard programs for Union (Table 11-116) and the similar programs for Enbridge that are contained under the Market Transformation Scorecard (Table 11-115). As noted in the OEB Decision and Order, the programs listed below are similar and thus included together. The programs addressed in this appendix are:

- C&I Operational Efficiency Improvement – Run it Right – Enbridge
- C&I Operational Efficiency Improvement – RunSmart – Union
- C&I Energy Management – Comprehensive Energy Management – Enbridge
- C&I Energy Management – Strategic Energy Management – Union

Table 11-115. Enbridge 2021 market transformation & energy management scorecard†

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
Run it Right	Participants	36	36	87	116	175	20.00%
Comprehensive Energy Management	Participants	2	2	22	29	44	20.00%
Residential Savings by Design	Builders	24	24	29	39	59	10.00%
Residential Savings by Design	Homes Built	2,514	2,514	2,329	3,105	4,658	15.00%
School Energy Competition	Schools	-	-	44	58	87	10.00%
Commercial Savings by Design	New Developments	17	17	28	37	56	25.00%

†Programs in grey text are not similar to Union programs under the Performance Based Scorecard, and not discussed in this Appendix. For these programs, please refer to Section 11.8.

Table 11-116. Union 2021 performance-based scorecard

Programs	Metrics	Verified Achievement		Metric Target			Weight
		Program-level Achievement	Metric-level Achievement	Lower Band	Target	Upper Band	
RunSmart	Participants	-	-	52	69	104	10.00%
	Savings %	0.00%	0.00%	0.33%	0.44%	0.67%	40.00%
Strategic Energy Management	Savings %	3.55%	3.55%	5.91%	7.87%	11.81%	50.00%

11.9.1 C&I Operational Efficiency Improvement – Run it Right – Enbridge

Overview

Table 11-117 shows the tracked and verified scorecard achievements for the 2021 Enbridge Run it Right (RIR) Program, with the metric of Participants. The RIR Program has two metrics under separate scorecards, CCM Savings (Resource Acquisition) and Participants (Market Transformation). Participants are discussed here, while the CCM Savings metric is discussed in Section 11.5. As a result of this review, the EC verifies 36 participants (100.00% of tracked). Table 11-117 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-117. Enbridge Market Transformation achievement: Run it Right participants metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Participants	36	36	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-118 to verify the metrics for the Run it Right program.

Table 11-118. Documentation used to verify the Run it Right program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	PDF scans of program participant documentation
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049

Participant Selection

Enbridge first provided the Tracking File listing RIR Project Codes, Account Numbers, and Confirmation Date. The spreadsheet listed 36 individual accounts. The EC requested full documentation for a sample of 15 projects.

Received Files

The EC received a combined PDF document for each project, which included:

- One program application
- One investigation report
- Either one implementation time record or work orders for the recommended measures.

The EC also received an Excel file detailing the monitoring start date for each project. The EC first confirmed the document IDs received matched the IDs requested and that documents for all participants had been received.

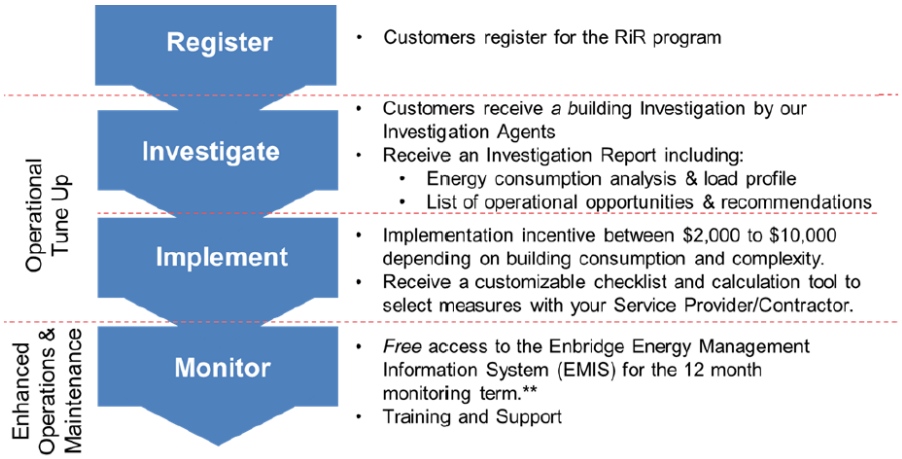
Verify Participation

Enbridge's Plan[105] states that:

> *Customers shall be deemed a "participant" in Enbridge's RiR offer for the purpose of the MTEM scorecard once they have entered the monitoring stage of the offer, which is the fourth of four steps inherent to this offer*.

Enbridge's plan further documents the four steps inherent to the offer to be: Register, Investigate, Implement, and Monitor (Figure 11-5). Combining the definition from Enbridge's plan with the figure, the EC interprets "participation" to require evidence of completing all four steps, including site energy use or savings monitoring produced by the fourth step.

Figure 11-5. Image of RIR Process Elements from Enbridge Plan[106]



Enbridge provided redacted program applications for 15 sites, satisfying intentional enrolment – the "register" step identified in Figure 11-5.

Enbridge provided investigation reports for the 15 sampled sites. Investigation reports provided estimated savings (analysis) for a site, as well as estimated savings by recommended measure. This document satisfies the second step identified in Figure 11-5.

For the 15 sampled sites, Enbridge provided either an implementation time record document or copies of work orders, either of which documented the execution of recommended work from the investigation reports. The EC considered either of these forms of documentation sufficient to satisfy the third step identified in Figure 11-5 for all projects submitted.

Enbridge provided an Excel file that listed the starting date for monitoring of the 15 sampled sites after project implementation, satisfying the fourth step identified in Figure 11-5.

Verification Result

As a result of this review, the EC verifies the scorecard metric of 36 participants (100.00% of tracked) for the Enbridge Run it Right program.

[105] Enbridge Gas Program Plan: DSM Plan Overview and Guiding Principles, EB-2015-0049, Tab 1, Schedule 4, Page 34 of 41
[106] Enbridge Gas Program Plan: DSM Plan Overview and Guiding Principles, EB-2015-0049, Tab 2, Schedule 1, Page 87 of 100

11.9.2 C&I Operational Efficiency Improvement – RunSmart – Union

No activity was reported for this program in 2021.

11.9.3 C&I Energy Management – Comprehensive Energy Management – Enbridge

Overview

Table 11-119 shows the tracked and verified scorecard achievements for the 2021 Enbridge Comprehensive Energy Management (CEM) program, with the metric of Participants. The RIR Program has two metrics under separate scorecards, CCM Savings (Resource Acquisition) and Participants (Market Transformation). Participants are discussed here, while the CCM Savings metric is discussed in Section 11.5. As a result of this review, the EC verifies two participants (100.00% of tracked). Table 11-119 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-119. Enbridge Market Transformation achievement: Comprehensive Energy Management participants metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Participants	2	2	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-120 to verify the metrics for the Comprehensive Energy Management program.

Table 11-120. Documentation used to verify the Comprehensive Energy Management program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	Various documents for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049

Participant Selection

Enbridge first provided the Tracking File listing CEM Project Codes, Account Numbers, Enrolment Date, and Energy Model Date. The spreadsheet listed two individual participants. The EC requested full documentation for both participants.

Received Files

The EC received two PDF application form documents, identified by CEM Project number. The EC first confirmed the documents received matched the IDs requested, and that documents for all participants had been received.

Verify Participation

Clear and specific criteria for participation in the CEM program were not readily available; rather, documentation indicates that the CEM program is intended to be a multi-year, 'holistic' process with ongoing engagement resulting in energy savings.

As a result, the EC understands that evidence of initial engagement and a specific agreement to participate are sufficient to verify participants for the purposes of the Market Transformation Scorecard metric of 'participants'.

The provided Project Files demonstrated that each participant applied for participation in the CEM program, signed by an applicant representative. In addition, the applications include declarations that the applicant:

- Acknowledges and confirms that they will commit resources to participate and identify energy efficiency opportunities
- Will create internal energy awareness
- Will share energy data with Enbridge
- Will allow continued communication with Enbridge

The EC confirmed documentation supports participation of both participants.

Verify Eligibility

The EC also used the Project File to confirm the eligibility of each participant,[107,108] namely to verify that customers had annual gas consumption between 340,000 m^3 and 5,000,000 m^3.

The Account Numbers listed in the Project Files matched Account Numbers listed in the Tracking File.

Project Files identified previous year gas consumption for the two customers:

- One customer with consumption between 340,000 m^3 and 5,000,000 m^3
- One customer with consumption greater than 5,000,000 m^3

Consumption of the larger participant was slightly greater than 5,000,000 m^3. Previous evaluations established that language in other parts of the plan make it clear that the target is large and complex commercial and industrial customers. Therefore, the EC feels that participants with consumption larger than the stated guideline are reasonably close to the expectations set by the plan, while participants with consumption significantly lower would not be. Since the participant is larger, the EC verifies the eligibility of this participant.

Verification Result

As a result of this review, the EC confirms that:

- Documentation confirmed all participants met the participation definition
- Documentation confirmed one of two participants met the eligibility definition
- Further review by the EC verified the remaining participant

The EC confirms the scorecard metric of 2 participants (100.00% of tracked) for the Enbridge Comprehensive Energy Management Program.

[107] Ontario Energy Board Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, page 47
[108] Enbridge Gas Program Plan: DSM Plan Overview and Guiding Principles, EB-2015-0049, Exhibit B, Tab 2, Schedule 1, Page 53 of 100

11.9.4 C&I Energy Management – Strategic Energy Management – Union

Overview

Table 11-121 shows the tracked and verified scorecard achievements for the 2021 Union Strategic Energy Management (SEM) program, with the metric of Percent Savings. As a result of this review, the EC verifies 3.55% savings (100.00% of tracked). Table 11-121 contains the following variables:

- Tracked: Metric value from original Tracking File sent by Enbridge upon first data request
- Verified: Metric value verified from review of Tracking File, Project Files, and other relevant documents identified in the Documentation section
- Ratio: Ratio of verified to tracked achievement. A value of 100.00% indicates that verified values match tracked values

Table 11-121. Union Performance Based achievement: Strategic Energy Management percent savings metric*

Metric	Achievement		Ratio
	Tracked	Verified	
Savings %	3.55%	3.55%	100.00%

*Not all values may compute exactly due to rounding.

Documentation

The EC used the documentation shown in Table 11-122 to verify the metrics for the Strategic Energy Management program.

Table 11-122. Documentation used to verify the Comprehensive Energy Management program

Report Language	Description or Citation
Enbridge-Provided Documentation	
Tracking File	Excel spreadsheet tracking metrics for all 2021 Enbridge DSM programs
Project Files	Various documents for each requested participant, supporting program metrics
Documents Used by EC	
OEB Decision	OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, OEB Revised Decision and Order, EB-2015-0029/EB-2015-0049, February 24, 2016 and OEB Decision and Order, EB-2019-0271, July 16, 2020
Enbridge Plan	Enbridge Gas Multi-Year DSM Plan (2015-2020), EB-2015-0049

Participant Selection

Union first provided the Tracking File listing Year, SEM Project Codes, Savings, Reference Consumption, and Percent Saved. The spreadsheet listed three individual participants, but only one participant had energy savings in 2021. The EC requested full documentation for this participant.

Received Files

The EC received one PDF document – a Savings Report that detailed the energy efficiency measures taken by the active participant and the resulting energy savings. The EC confirmed that the participant details in this documentation matched the details listed in the Tracking File.

Verify Savings Calculation

Union's plan defines savings percent[109] as "the aggregate percentage of savings achieved by the program participants within a program year." The savings report utilized on-site meter data and baseline consumption to model consumption and

[109] Description of Strategic Energy Management Savings Percent from Overview of Union's Proposed 2015-2020 DSM Plan, 2015EB-2015-0029, Exhibit A, Tab 3, Page 35 of 73

reductions in gas usage resulting from the implementation of the SEM Program. Union used the following equation for the participant's percentage savings:

$$Participant\ Savings\ \% = \frac{Pre\ Consumption\ Change}{Listed\ PY\ Consumption}$$

Union's tracked calculation then took the individual savings percent values for each participant and used the following equation to arrive at a program-level Savings Percent value:

$$\frac{\sum Participant\ Savings\ \%}{Count\ of\ Participants}$$

The EC agrees and confirms this methodology.

Verification Result

As a result of this review, the EC confirms a Savings Percent value of 3.55% (100.00% of tracked) for the Strategic Energy Management Savings Percent metric.

11.10 Appendix J: Review of Metric Target Calculations

Overview

For 2021 (and through the current framework), targets for metrics that existed in the previous year are defined based on the previous year's (PY) achievement[110] and spend,[111] the current year (CY) budget, and a multiplier.[112] In general, metric targets follow this generic formula:

$$Metric\ Target = \frac{PY\ Achievement}{PY\ Spend} \times CY\ Budget \times Multiplier$$

The exception to the generic formula above is the Union Large Volume Program, which uses the 3 Year cost effectiveness (CE),[113] the current year (CY) budget, and a multiplier of 2% (1.02):

$$Union\ Large\ Volume\ Target = 3\ Year\ CE \times CY\ Budget \times 1.02$$

Calculation Inputs

Table 11-123 and Table 11-124 provide the specific values used to calculate the 2021 metric targets.

Table 11-125 provides annual cost effectiveness (CE) ratios for the previous 3-years of the Union Large Volume Program and the average of those years, rounded to two digits past the decimal. The annual ratio is calculated via the final verified metric achievement divided by final actual program spend for that year. This rounded 3-year average value is what DNV used for target calculations.

Table 11-126 and Table 11-127 provide the targets for all 2021 metrics, calculation-based and prescribed.

Table 11-123. Enbridge Metric Target Calculation Inputs – 2021

Scorecard	Metric	2020 Achievement	2020 Spend	2021 Budget	Multiplier
Resource Acquisition	LV RA (CCM)	408,464,079	$8,133,265	$9,922,880	1.02
	SV RA (CCM)	268,310,350	$31,759,421	$27,752,670	
	HEC Participants*	14,013	$26,623,413	$18,727,200	
Low Income	LISF (CCM)	26,642,997	$6,363,661	$6,736,859	
	LIMR (CCM)	67,637,303	$2,947,688	$3,967,353	
	LINC Applications	15	$1,718,984	$1,456,560	
Market Transformation	CSBD Developments	36	$1,192,097	$1,122,068	1.10
	CEM Participants	7	$246,573	$941,562	
	RSBD Builders	35	$3,326,434	$3,392,296	
	RSBD Homes	2,768			
	RiR Participants	65	$202,106	$329,209	
	SEC Schools	7	$68,748	$520,200	

*HEC budget is a subset of, and not a separate line item from, the Resource Acquisition budget.

[110] Gas savings values used in calculating targets for 2021 are slightly different than the final savings values reported in the 2020 Annual Verification report because achievements for the target calculations use the more updated TRM 5.0 assumptions, compared to the final 2020 achievements which use the TRM 4.0 assumptions.

[111] Program spending used in calculating targets do not include overheads. They are also slightly different than spending values included in the 2020 Annual Verification report, as some of the program-specific spending in the 2020 report includes program-specific overheads. Budget values used in calculating targets also exclude overhead costs.

[112] 1.02 or 1.10 depending on the scorecard

[113] Three-year rolling average (2018-2020) Rate T2/T100 cost effectiveness where cost-effectiveness here is defined as "Final verified metric achievement used for MRAMVA purposes divided by final actual program spend for that year."

Table 11-124. Union Metric Target Calculation Inputs – 2021

Scorecard	Metric	2019 Achievement	2019 Spend	2021 Budget	Multiplier
Resource Acquisition	RA (CCM)	669,892,921	$27,717,300	$31,183,000	1.02
	HRR Participants*	7,619	$15,652,806	$12,226,000	
Large Volume	LV (CCM)†	36.14 (see Table 11-125)		$3,150,000	
Low Income	LISF (CCM)	38,411,013	$7,233,289	$9,739,000	
	LIMF-SA (CCM)	12,142,699	$1,654,002	$2,329,990	
	LIMF-MR (CCM)	8,316,698	$882,382	$1,243,010	
Market Transformation	CNC Developments	24	$1,041,572	$1,000,000	1.10
	OH % Built	39.19%	$595,522	$841,000	
Performance Based	RS Participants	-	$58,471	$163,000	
	RS Savings %	-1.52%	$58,471		
	SEM Savings %	2.61%	$232,526	$639,000	

*HRR budget is a subset of, and not a separate line item from, the Resource Acquisition budget.
†Union's Large Volume program metric target is based on different inputs; instead of the 2020 CCM achievement, the formula is based off the three-year rolling average (2018-2020) Rate T2/Rate 100 cost effectiveness. This average value (36.14) is what is listed for the 2021 achievement.

Table 11-125. Union Large Volume Cost Effectiveness* Ratios

Year	CE Ratio*
2018	38.10
2019	26.96
2020	43.35
3-Year Average	**36.14**

*Cost effectiveness here is defined as "Final verified metric achievement used for MRAMVA purposes divided by final actual program spend for that year." Annual CE Ratios and the 3-year average are rounded to 2 digits past the decimal.

Table 11-126. Enbridge Metric Targets – 2021

Scorecard	Metric	2021 Target
Resource Acquisition	LV RA (CCM)	508,307,882
	SV RA (CCM)	239,149,677
	HEC Participants	10,054
Low Income	LISF (CCM)	28,769,589
	LIMR (CCM)	92,855,103
	LINC Applications	13
Market Transformation	CSBD Developments	37
	CEM Participants	29
	RSBD Builders	39
	RSBD Homes	3,105
	RiR Participants	116
	SEC Schools	58

Table 11-127. Union Metric Targets – 2021

Scorecard	Metric	2021 Target
Resource Acquisition	RA (CCM)	768,727,712
	HRR Participants	6,070
Large Volume	LV (CCM)	116,103,299
Low Income	LISF (CCM)	52,751,464
	LIMF-SA (CCM)	17,447,511
	LIMF-MR (CCM)	11,950,032
Market Transformation	CNC Developments	25
	OH % Built	60.88%
Performance Based	RS Participants	69
	RS Savings %	0.44%
	SEM Savings %	7.87%

11.11 Appendix K: Review of Lost Revenue and DSM Shareholder Incentive Calculations

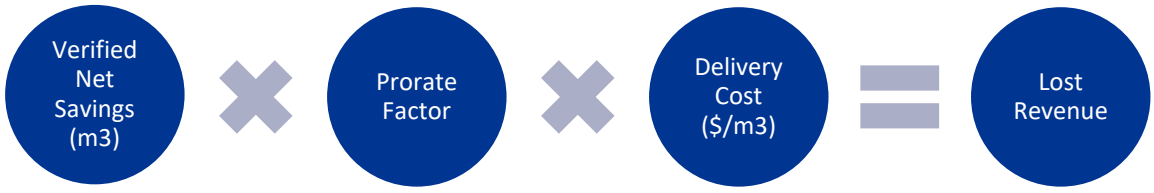
This appendix describes the EC team's review of the lost revenue and demand side management shareholder incentive calculations.

11.11.1 Lost Revenue Calculations

The basic approach to the lost revenue calculation is illustrated in Figure 11-6. The calculation is based on the following factors:

- The verified net natural gas savings (in annual cubic meters) by applicable rate class using the best available information at the time of the verification
- The delivery cost of the natural gas by rate class
- The month in which the measure was installed, represented in the equation below as a prorate factor

Figure 11-6. Lost revenue calculation



Lost revenues are summed across all measures in a rate class. Then the lost revenues for all applicable rate classes are summed to calculate total lost revenues per utility.

The applicable rate classes for Enbridge and Union are shown in Table 11-128. Values specific to these rates for the evaluated year are included in Section 11.12.

Table 11-128. Rate classes for lost revenue calculation

Enbridge	Union
Rate 110	M4 Industrial
Rate 115	M5 Industrial
Rate 135	M7 Industrial
Rate 145	T1 Industrial
Rate 170	T2 Industrial
	20 Industrial
	100 Industrial

The methods to compute each of the components shown in Figure 11-6. are described in the following sections.

Lost revenue: Verified Net Savings

The lost revenue calculation first utilizes verified net savings, calculated using best available inputs and assumptions at the time of the verification. For prescriptive program savings, this is currently the December 2021 update to the TRM. This differs from the savings used for the DSM shareholder incentive calculation, which uses the energy savings at the time of program planning.

Lost revenue: Prorate Factor Calculation

The prorate factor is simply the proportion of the annual net savings that will be included in the lost revenue calculation, based on the number of months the gas-saving measure was installed. Table 11-129 shows the prorate factors for each installation month. Prorated savings are calculated by multiplying the measure's annual savings by the ratio for the month it was installed.

Table 11-129. Lost revenue installation month savings ratio*

Month	Ratio (12-Month+1)/12
January	1.0000
February	0.9167
March	0.8333
April	0.7500
May	0.6667
June	0.5833
July	0.5000
August	0.4167
September	0.3333
October	0.2500
November	0.1667
December	0.0833

*Not all values may compute exactly due to rounding.

For example, the calculation assigns 12 months of savings to measures installed in January and one month of savings to measures installed in December.

Lost revenue: Delivery Cost Calculation

Delivery rates are expressed as cost per 1,000 cubic meters. Prorated energy savings are divided by 1,000 to convert savings in cubic meters to savings in thousands of cubic meters, which are then multiplied by the delivery rate for the respective rate class to determine lost revenue by rate class. The delivery rate is not verified as part of this evaluation.

Lost revenue: Summing lost revenue Savings

Lost revenue for each rate class is calculated by summing the lost revenue for all measures within the rate class. Total lost revenue for each utility is calculated by summing the lost revenue across all applicable rate classes:

$$Total\ Lost\ Revenue = \sum_{Rate\ Class}^{Utility} \sum_{Measure}^{Rate\ Class} Lost\ Revenue$$

11.11.2 DSM shareholder incentive calculations

The DSM shareholder incentive calculations are more complex than the lost revenue calculations. DSM shareholder incentive calculations are based on:

- The verified program achievements compared to the target metrics for that scorecard
- The weight placed on each metric within each scorecard
- The maximum incentive achievable for that scorecard

Because all three of these factors vary by utility and scorecard, a simple diagram is not possible.

DNV independently calculated DSM shareholder incentive values for both legacy utilities. The following sections lay out the calculation methodology, as well as inputs used for each utility.

The EC confirmed the lower band, upper band, target metric, weights, maximum incentives, rate classes, and rates for both utilities with the EAC.

DSM shareholder incentive: verification savings values

Where the verified net savings used in the lost revenue calculation represent the best available information at the time of the verification, the verified net savings used in the DSM shareholder incentive are calculated using the savings values leveraged during the program planning process.

DSM shareholder incentive: metric score

DSM shareholder incentive calculations are based on the verified metric achievement identified within each scorecard compared to the target value. For each metric, DNV first determines the percent of metric achieved.

$$\%\ Metric\ Achieved = \frac{achieved\ metric}{target\ metric}$$

If the achieved metric is less than or equal to the 2021 Target, the Metric Score is then calculated as:

$$Metric\ Score = 1 - \frac{0.25 * (target\ metric - achieved\ metric)}{(target\ metric - lower\ band)}$$

If the achieved metric is greater than the 2021 Target, the Metric Score is then calculated as:

$$Metric\ Score = 1 + \frac{0.5 * (achieved\ metric - target\ metric)}{(upper\ band - target\ metric)}$$

DSM shareholder incentive: weighted metric score

The weighted metric score is determined by multiplying the metric score by its corresponding weight. Each metric within the scorecard is weighted, with all weights within each scorecard summing to 100.00%. Per the OEB Decision and Order, the OEB approved maximum and minimum achievement limits per metric of 200% and 0%, respectively.[114] As a result, all Metric Scores are capped at 200%, thereby limiting the influence of any one metric within the weighted scorecard achievement calculation to twice its weight.

DSM shareholder incentive: weighted scorecard achievement

The weighted metrics within each scorecard are summed to calculate the weighted scorecard achievement:

$$weighted\ scorecard\ achievement = \sum_{Scorecard} (weight * Metric\ Score)$$

DSM shareholder incentive: incentive calculation

The weighted scorecard achievement (WSA) is then used to calculate the Shareholder Incentive for that Scorecard. The appropriate calculation is dependent on the WSA value, as demonstrated in Table 11-130.

[114] OEB Decision and Order, EB-2015-0029/EB-2015-0049, January 20, 2016, page 80

Table 11-130. Calculation to determine shareholder incentive

WSA Value	Incentive
<.75	0
.75≤WSA<1	$(40\%\ x\ Max\ Incentive)\frac{(WSA-0.75)}{.25}$
1≤WSA<1.5	$(40\%\ Max\ Incentive)+(60\%\ Max\ Incentive)*\frac{(WSA-1)}{0.5}$
1.5≤WSA	Max Incentive

The shareholder incentives for each scorecard are summed to calculate each utility's total incentive:

$$Total\ Incentive = \sum_{Utility} Scorecard\ Incentive$$

11.11.3 Example Calculations

Lost revenue

As an example, a widget carries an annual lost revenue verified savings value of 500 m^3 (annual, net savings). If that unit was installed in January, 500 m^3 (500 x 1.000) would be verified for lost revenue. If that same unit were installed in July, 250 m^3 (500 x 0.500) would be verified and if installed in November, 83.33 m^3 (500 x .1667). Table 11-131 shows the prorated total savings for all widgets with one installed per month, in 1000 m^3.

Table 11-131. Example lost revenue savings total for single rate class with monthly widget installation*

Month	Ratio (12-Month+1)/12	Units Installed	Lost Revenue Net Annual Gas Savings (m^3)	Prorated Energy Savings (m^3)	Lost Revenue Energy Savings (1000 m^3)
January	1.00	1	500	500.00	0.50
February	0.92	1	500	458.33	0.46
March	0.83	1	500	416.67	0.42
April	0.75	1	500	375.00	0.38
May	0.67	1	500	333.33	0.33
June	0.58	1	500	291.67	0.29
July	0.50	1	500	250.00	0.25
August	0.42	1	500	208.33	0.21
September	0.33	1	500	166.67	0.17
October	0.25	1	500	125.00	0.13
November	0.17	1	500	83.33	0.08
December	0.08	1	500	41.67	0.04
Total					**3.25**

*Not all values may compute exactly due to rounding.

In Table 11-132, the above example savings total is represented by Rate Class II – one widget per month was the sum of all measures performed within customers in that rate class. The verified lost revenue energy savings for the class are multiplied by the rate for that class to determine the lost revenue for that rate class; lost revenue for Rate Class II totalling $48.75 from energy savings of 3.25 at a rate of $15.00 per 1,000 m^3. All applicable rate class lost revenue are then summed for total lost revenue.

Table 11-132. Example total lost revenue*

Rate Class	Lost Revenue Energy Savings (1000 m^3)	Rate ($/1000 m^3)	Lost Revenue
I	25.00	$5.55	$138.75
II	**3.25**	**$15.00**	**$48.75**
III	150.00	$1.50	$225.00
IV	100.00	$4.00	$400.00
V	5.10	$25.50	$130.05
VI	1.26	$10.00	$12.60
Total Lost Revenue			$955.15

*Not all values may compute exactly due to rounding.

DSM shareholder incentive

The first step in calculating the DSM shareholder incentive is to calculate the percent of the target metric that was achieved, which is a simple ratio of the achieved metric divided by the target metric. The second step is to determine the correct formula based on whether the verified achievement for the scorecard metric was at, above, or below the annual target. In the example in Table 11-133, the verified achievement for Scorecard A CCM was below the 2021 Target, so the formula for achievement below target is used to determine the metric score. The Verified Achievement for participants was above the 2021 Target, so the alternative calculation is used. Both formulas are illustrated below.

Table 11-133. Example metric score*

Scorecard	Metric	Verified Achievement	Lower Band	2021 Target	Upper Band	Metric Score
Scorecard A	CCM	9,000,000	7,500,000	10,000,000	15,000,000	0.9
	Participants	250	150	200	300	1.25

*Not all values may compute exactly due to rounding.

$$CCM\ Metric\ Score = 1 - \frac{.25 * (10{,}000{,}000 - 9{,}000{,}000)}{(10{,}000{,}000 - 7{,}500{,}000)} = 1 - 0.1 = 0.9$$

$$Participant\ Metric\ Score = 1 + \frac{0.5 * (250 - 200)}{(300 - 200)} = 1 + .25 = 1.25$$

The metric score for each metric is then multiplied by the applicable weight. In this example, CCM savings is weighted at 75% and participants at 25%. The weighted metric scores are summed for the weighted scorecard achievement.

Table 11-134. Example scorecard weighted score (WSA)*

Scorecard	Metric	Metric Score	Weight	Weighted Metric Score	Weighted Scorecard Achievement
Scorecard A	CCM	0.9	75%	0.675	0.9875
	Participants	1.25	25%	0.3125	

*Not all values may compute exactly due to rounding.

For Scorecard A, if we assume a maximum incentive value of $100,000, a weighted scorecard achievement of 0.9875 would result in an incentive of $38,000, as demonstrated below.

$$(40\%\ x\ \$100{,}000)\frac{(0.9875 - .75)}{.25} = \$40{,}000\ x\ \frac{(0.2375)}{.25} = \$40{,}000\ x\ 0.95 = \$38{,}000$$

11.12 Appendix L: Lost Revenue and DSM Shareholder Incentive: Detailed Tables

11.12.1 Enbridge DSM shareholder incentive

Table 11-135. Enbridge's 2021 Resource Acquisition targets, achievements, and incentive*

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
Large Volume Customer - CCM	508,307,882	430,134,894	40.00%	84.62%	33.85%
Small Volume Customer - CCM	239,149,677	317,200,551	40.00%	132.64%	53.05%
Home Energy Conservation Participants	10,054	15,321	20.00%	152.39%	30.48%
Verified Total Weighted Scorecard Achieved					117.38%
Maximum Scorecard Incentive					$7,012,787
Verified Scorecard Incentive Achieved					**$4,267,746**

*Not all values may compute exactly due to rounding.

Table 11-136. Enbridge's 2021 Low Income scorecard targets, achievements, and incentive*

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
Home Winterproofing CCM	28,769,589	26,443,935	45.00%	91.92%	41.36%
Low Income Multi Residential CCM	92,855,103	88,304,418	45.00%	95.10%	42.79%
Low Income New Construction Applications	13	13	10.00%	100.00%	10.00%
Verified Total Weighted Scorecard Achieved					94.16%
Maximum Scorecard Incentive					$2,263,561
Verified Scorecard Incentive Achieved					**$693,807**

*Not all values may compute exactly due to rounding.

Table 11-137. Enbridge's 2021 Market Transformation scorecard targets, achievements, and incentive*

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
School Energy Competition Schools	58	-	10.00%	0.00%	0.00%
Run it Right Participants	116	36	20.00%	31.03%	6.21%
Comprehensive Energy Management Participants	29	2	20.00%	3.57%	0.71%
Residential Savings by Design Builders	39	24	10.00%	62.50%	6.25%
Residential Savings by Design Homes	3,105	2,514	15.00%	80.96%	12.14%
Commercial Savings by Design Developments	37	17	25.00%	44.44%	11.11%
Verified Total Weighted Scorecard Achieved**					36.43%
Maximum Scorecard Incentive					$1,173,652
Verified Scorecard Incentive Achieved					**$0**

*Not all values may compute exactly due to rounding.
**A minimum total weighted scorecard achievement level of 75% is required to earn a portion of the available shareholder incentive.

11.12.2 Union DSM shareholder incentive

Table 11-138. Union's 2021 Resource Acquisition targets, achievements, and incentive*

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
CCM	768,727,712	635,084,369	75.00%	82.61%	61.96%
Home Reno Rebate Participants	6,070	5,032	25.00%	82.89%	20.72%
Verified Total Weighted Scorecard Achieved					82.68%
Maximum Scorecard Incentive					$6,562,712
Verified Scorecard Incentive Achieved					**$806,921**

*Not all values may compute exactly due to rounding.

Table 11-139. Union's 2021 Low Income targets, achievements, and incentive*

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
Single Family CCM	52,751,464	45,903,844	60.00%	87.02%	52.21%
Multi-Family - Social & Assisted CCM	17,447,511	9,535,480	35.00%	54.65%	19.13%
Multi-Family - Market Rate CCM	11,950,032	8,307,799	5.00%	69.52%	3.48%
Verified Total Weighted Scorecard Achieved**					74.82%
Maximum Scorecard Incentive					$2,604,447
Verified Scorecard Incentive Achieved					**$0**

*Not all values may compute exactly due to rounding.
**A minimum total weighted scorecard achievement level of 75% is required to earn a portion of the available shareholder incentive.

Table 11-140. Union's 2021 Large Volume targets, achievements, and incentive*

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
CCM	116,103,299	141,733,709	100.00%	122.08%	122.08%
Verified Total Weighted Scorecard Achieved					122.08%
Maximum Scorecard Incentive					$694,265
Verified Scorecard Incentive Achieved					**$461,621**

*Not all values may compute exactly due to rounding.

Table 11-141. Union's 2021 Market Transformation targets, achievements, and incentive*

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
Optimum Home Percentage of Homes Built	60.88%	73.08%	50.00%	120.03%	60.02%
Commercial New Construction Developments	25	24	50.00%	95.83%	47.92%
Verified Total Weighted Scorecard Achieved					107.93%
Maximum Scorecard Incentive					$405,810
Verified Scorecard Incentive Achieved					**$200,960**

*Not all values may compute exactly due to rounding.

Table 11-142. Union's 2021 Performance Based targets, achievements, and incentive*

Metric	Target	Verified Achievement	Weight	Metric Score	Weighted Metric Score
RunSmart Participants	69	-	10.00%	0.00%	0.00%
RunSmart Savings %	0.44%	0.00%	40.00%	0.00%	0.00%
Strategic Energy Management Savings %	7.87%	3.55%	50.00%	44.93%	22.46%
Verified Total Weighted Scorecard Achieved**					22.46%
Maximum Scorecard Incentive					$182,765
Verified Scorecard Incentive Achieved					**$0**

*Not all values may compute exactly due to rounding.
**A minimum total weighted scorecard achievement level of 75% is required to earn a portion of the available shareholder incentive.

11.12.3 Enbridge Lost Revenue

Table 11-143. Enbridge lost revenue volumes (10^3 m^3) by rate class, prorated by month*

Rate Class	Savings Volume by Month (1,000 m3)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Rate 110	1,765	272	107	421	178	45	149	33	115	141	11	45	3,283
Rate 115	-	-	706	-	99	-	-	360	16	37	-	-	1,219
Rate 135	-	-	-	378	1,275	63	22	-	-	-	-	-	1,738
Rate 145	-	-	108	-	-	-	-	-	-	-	-	-	108
Rate 170	13	47	-	-	-	-	-	-	115	14	25	-	214
TOTAL	**1,778**	**319**	**922**	**799**	**1,553**	**107**	**171**	**393**	**247**	**191**	**36**	**45**	**6,562**

*Not all values may compute exactly due to rounding.

Table 11-144. Enbridge lost revenue volumes (10^3 m^3) total volume, delivery rates, and revenue impact by rate class*

Rate Class	Savings Volume (1,000 m3)	Delivery Rate ($/1,000 m3)	Revenue Impact ($)
Rate 110	3,283	$5.95	$19,534
Rate 115	1,219	$2.05	$2,495
Rate 135	1,738	$17.71	$30,787
Rate 145	108	$34.93	$3,786
Rate 170	214	$2.83	$605
TOTAL	**6,562**		**$57,207**

*Not all values may compute exactly due to rounding.

11.12.4 Union Lost Revenue

Table 11-145. Union lost revenue volumes (10^3 m^3) by rate class, prorated by month*

Rate Class	Savings Volume by Month (1,000 m3)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
M4 Industrial	1,986	1,272	1,076	99	155	455	70	56	55	0	195	-	5,420
M5 Industrial	37	-	4	3	2	2	18	79	-	-	-	-	145
M7 Industrial	5,987	1,988	495	189	113	698	437	514	94	264	88	211	11,079
T1 Industrial	38	-	-	-	-	35	-	-	-	22	2	-	98
T2 Industrial	3,924	15	124	-	120	36	8	175	230	24	239	-	4,893
20 Industrial	89	6	22	-	13	-	3	-	15	3	6	1	157
100 Industrial	2,009	-	8	1	38	12	-	-	-	27	87	-	2,182
TOTAL	14,071	3,280	1,729	293	440	1,238	536	824	394	340	617	211	**23,974**

*Not all values may compute exactly due to rounding.

Table 11-146. Union lost revenue volumes (10^3 m^3) total volume, delivery rates, and revenue impact by rate class*

Rate Class	Savings Volume (1,000 m3)	Delivery Rate ($/1,000 m3)	Revenue Impact ($)
M4 Industrial	5,420	$16.56	$89,768
M5 Industrial	145	$28.88	$4,200
M7 Industrial	11,079	$2.80	$31,007
T1 Industrial	98	$1.11	$109
T2 Industrial	4,893	$0.21	$1,042
20 Industrial	157	$7.30	$1,142
100 Industrial	2,182	$2.73	$5,948
TOTAL	**23,974**		**$133,216**

*Not all values may compute exactly due to rounding.

11.13 Appendix M: Prescriptive Savings Verification

This appendix describes the detailed process used to verify the reported (tracked) prescriptive and quasi-prescriptive savings for Enbridge and Union programs.

11.13.1 Data Sources

Verification of prescriptive measures relies on several data sources provided by Enbridge and Union.

Tracking Files

The EC received one tracking file each from Enbridge and Union. Both tracking files are Excel files and include prescriptive measures and additional information for measures from non-prescriptive programs.

TRM - Joint Submissions

The EC utilized documents titled “New and Updated DSM Measures - Joint Submission from Union Gas Ltd. and Enbridge Gas Distribution,” referred to in this report as TRMs. The EC used the November 2020 TRM (TRM 5.0) as the primary source for identifying prescribed values, such as energy savings and measure life, for prescriptive measures. In addition to that primary TRM, the EC also used TRM 5.0[115].

Other Supporting Documentation

The Joint Submission documents did not contain all of the necessary detail to verify the savings for all measures. For example, savings for commercial ENERGY STAR combination ovens were not included in TRM 5.0. All prescriptive measures and corresponding verification sources are listed in the tables at the end of this appendix.

In addition to the TRMs, the EC also used the following for verification of savings for prescriptive measures, as cited in the tables at the end of this appendix.

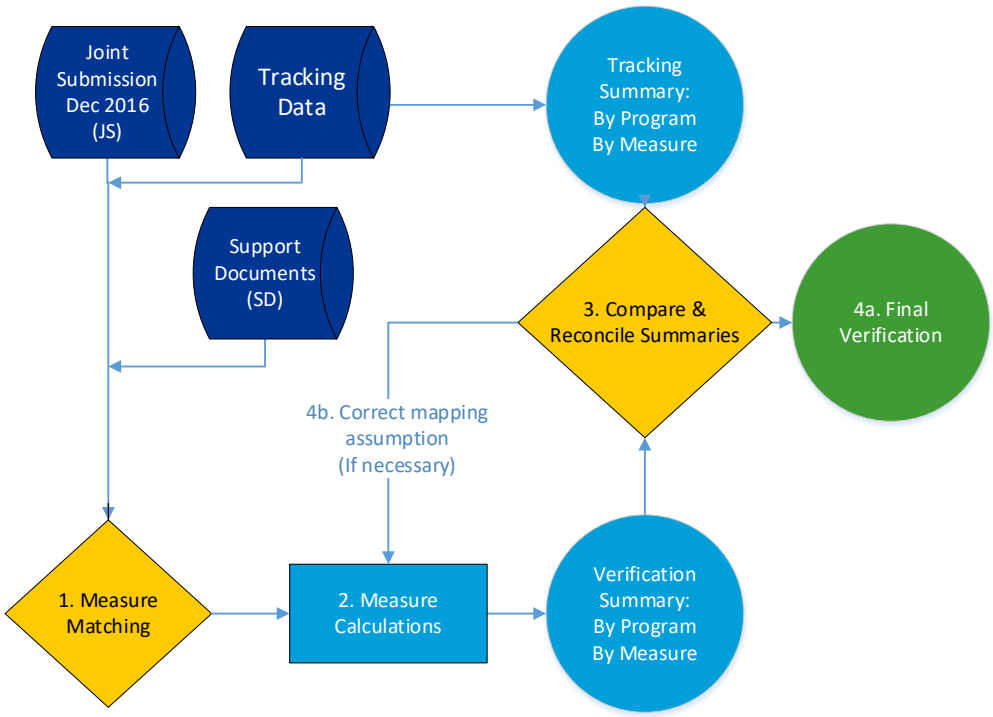
- C&I Prescriptive Showerheads, Enbridge, “Showerhead Verification Among Rental Buildings”, Ipsos Research, March 2012
- C&I Prescriptive Verification Study, “2017 C&I Prescriptive Study – Measure of NTG Factors and Gross Savings Verification”, Itron, June 7, 2019
- Commercial ENERGY STAR Combination Oven Sub Doc, “00_Commercial ENERGY STAR Combi Oven_EGI_July-16-2021-Sub Doc”, July 16, 2021
- “Low Income Kits Verification Study”: Final Report Following an Audit of the Union Gas ESK - Helping Homes Conserve – HHC – Program, Beslin Communication Group, March 15, 2013
- “TAPS Report”, TAPS Verification Program 2012 Year End Research Report, Study CR-604, Quadra Research, April 3, 2013
- “Adaptive Thermostat Ping Report”, 2021 Adaptive Thermostats Ping Reports LUG and LEG

[115] Natural Gas Demand Side Management Technical Resource Manual Version 5.0

11.13.2 Overall Methodology

The EC used a straightforward process to consistently verify savings for both utilities, summarized in Figure 11-7.

Figure 11-7. Savings verification process



The process includes the following high-level steps. Additional detail is presented below.

1. Manually match individual project measure savings against Joint Submission (JS) and Support Documents (SD) values, based first on measure name and then on other attributes, to calculate savings.
2. Calculate gross and net annual and lifetime savings for all measures.
3. Compare the summarized calculated savings and the tracked savings to identify discrepancies or disagreements.
4. When the EC determined that a discrepancy was due to an error in assigning the correct savings value, the EC assigned a new savings value to the measure and re-compared totals (4b). Once the EC resolved the correct savings value (through continued investigation of measure or clarification with utility) the record was verified (4a).

Table 11-147 shows the variables used from the utility tracking data to verify, summarize, and reconcile savings values. While variables such as measure life or free ridership were present in the tracking data, these were not used by the EC to calculate verified savings, but to identify discrepancies between verification and tracking summaries when comparing and reconciling savings totals. The EC used TRM or SD values for the verified savings calculations.

Table 11-147. Tracking variables used for prescriptive savings verification

Tracking Variable	Used In		
	Verification/ Summary	Tracking Summary	Compare & Reconcile Summaries
Scorecard	X		X
Program	X		X
Decision Type (Early Replace, Retrofit, etc.)	X		X
Measure Name	X		X
Building Type	X		X
Equipment Type	X		X
Install Type	X		X
Number of Units	X		X
Capacity	X		X
Measure Life			X
Free Rider			X
Adjustment Factor			X
Gross Annual Natural Gas Savings (m3)		X	X
Net Annual Natural Gas Savings (m3)		X	X
Gross Cumulative Natural Gas Savings (m3)		X	X
Net Cumulative Natural Gas Savings (m3)		X	X

1. Measure Matching

The EC manually mapped measures into groups. Measures were filtered by name to assign them to a group, then matched against the TRM and SD measures to identify the correct savings values. For each project, the EC confirmed that the savings value listed for the measure matched the value listed for that measure type in the TRM and SD. The tables at the end of this appendix list all tracked measure groups and their corresponding savings values and JS or SD source for Enbridge and Union, respectively.

2. Measure Calculations

There are two types of prescriptive measure calculations: Pure-Prescriptive and Quasi-Prescriptive. Quasi-Prescriptive measure savings require more than the per unit savings and the number of units to determine annual gross savings. For example, some boiler measures require the capacity of the boiler. Table 11-148 summarizes the differences between the two types.

Table 11-148. Explanation of calculation inputs for two types of prescriptive measures

Savings Type	Purely Prescriptive	Quasi-Prescriptive
Annual Gross	Per Unit Savings * # of Units	Unit Capacity Savings * Unit Capacity * # of Units
Annual Net	Annual Gross * (1 - Free Ridership) * Adjustment	
Lifetime Gross	Annual Gross * Measure Life	
Lifetime Net (CCM)	Annual Net * Measure Life	

The EC used Excel macros to identity savings inputs and apply savings calculations. The use of macros ensured consistent application of savings calculations and allowed for quick and accurate savings updates. The tables at the end of this appendix list all calculated measure totals, as verified by the EC.

3. Compare & Reconcile Summaries

The EC summed savings values from utility tracking and from EC verification calculations by program and measure type, and tabulated by Annual Gross, Annual Net, Lifetime Gross, Lifetime Net, and project measure counts. The EC did this with the Pivot Table function in Excel, creating Tracking (utility tracking data) and Verification (EC calculated) Summaries, which provided two benefits. First, the EC was able to identify discrepancies between listed measure names, because any differences would result in a different number of summary rows between the two tables. Second, the pivot tables allowed for quick and accurate updates when the EC performed adjustments to our original matches.

By reviewing differences between the two summaries, the EC identified errors in the EC matches and differences between the EC matches and the original utility tracking data, allowing us to investigate the discrepancies. The tables at the end of this appendix lists all verification discrepancies where:

- **The tracking data did not contain sufficient information to identify savings:** In general, these measures were resolved with additional documentation and resulted in no change to savings. They are listed in this appendix to document the evaluation process and communication between the evaluator and the utility.
- **The tracking data was incorrect:** This may have been because different savings factors were identified through the verification process. The tables include the details for each measure.

4. Final Verification

Once all tracked measures were matched to TRM values, the savings calculated, and all discrepancies reconciled or explained, verified savings summaries were finalized. Final savings totals for each program are available within the appropriate appendix in this report.

11.13.3 Savings Calculation Values

Savings tables in this section utilize measure names and units from the TRM wherever possible. Utilities utilized different units (BTU vs kBTU) or name variations, those are not used here.

Table 11-149. Enbridge measure savings calculation values*

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Direct Install	Air Curtain - Dock-In - 10 x 10	Pure	TRM 5.0	5,517.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Dock-In - 8 x 10	Pure	TRM 5.0	4,941.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Dock-In - 8 x 8	Pure	TRM 5.0	4,713.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 10 x 10	Pure	TRM 5.0	4,844.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 12 x 12	Pure	TRM 5.0	5,753.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 14 x 14	Pure	TRM 5.0	6,504.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 16 x 16	Pure	TRM 5.0	7,081.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 18 x 18	Pure	TRM 5.0	7,459.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 20 x 20	Pure	TRM 5.0	7,605.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	DCKV- RF - 10,001 to 15,000 cfm	Pure	TRM 5.0	17,529.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	DCKV- RF - 5,001 to 10,000 cfm	Pure	TRM 5.0	10,517.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	DCKV- RF - Up to 5,000 cfm	Pure	TRM 5.0	4,207.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	2,041.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	1,897.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	1,977.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	5,087.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	4,853.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	4,988.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Shelter (10x10)	Pure	TRM 5.0	1,736.00	unit	10	100.00%	5.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Direct Install	Dock Door Seals - Shelter (10x10)	Pure	TRM 5.0	4,501.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Commercial Condensing Unit Heater	Quasi	TRM 5.0	7.89	kBTU/hr input capacity	18	100.00%	0.00%	100.00%
C&I Prescriptive	Commercial Energy Star Combi Oven	Pure	ENERGY STAR Combination Oven Substantiation Document	1,186.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Energy Star Convection Oven	Pure	TRM 5.0	865.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Energy Star Double Rack Oven	Pure	TRM 5.0	1,076.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Energy Star Fryer	Pure	TRM 5.0	1,408.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Energy Star Steam Cooker	Pure	TRM 5.0	8,889.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Under-Fired Broiler	Pure	TRM 5.0	2,511.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Condensing MUA VFD up to 14,000 CFM - Multi-Residential/Long Term Care [New/Existing]	Quasi	TRM 5.0	3.00	CFM	20	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 250 kBTU/hr	Quasi	TRM 5.0	1.3600	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 250 kBTU/hr	Quasi	TRM 5.0	3.09	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 250 kBTU/hr	Quasi	TRM 5.0	2.22	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	Quasi	TRM 5.0	2.22	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	Quasi	TRM 5.0	1.3600	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	Quasi	TRM 5.0	3.09	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Mixed	TRM 5.0	212+0.79	unit + kBtu/hr input capacity	20	100.00%	2.00%	100.00%
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Mixed	TRM 5.0	212+1.79	unit + kBtu/hr input capacity	20	100.00%	2.00%	100.00%
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Mixed	TRM 5.0	212+1.29	unit + kBtu/hr input capacity	20	100.00%	2.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Prescriptive	DCKV 10,001 - 15,000 CFM [New]	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	17,529.00	unit	15	102.74%	38.00%	100.00%
C&I Prescriptive	DCKV 5,001 - 10,000 CFM [Existing]	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	10,517.00	unit	15	102.74%	38.00%	100.00%
C&I Prescriptive	DCKV 5,001 - 10,000 CFM [New]	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	10,517.00	unit	15	102.74%	38.00%	100.00%
C&I Prescriptive	DCKV up to 5,000 CFM [New]	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	4,207.00	unit	15	102.74%	38.00%	100.00%
C&I Prescriptive	DCKV up to 5000 CFM [Existing]	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	4,207.00	unit	15	102.74%	38.00%	100.00%
C&I Prescriptive	DCV Single Zone Office with Maintenance [Existing]	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	0.1120	sq ft	15	104.14%	92.00%	100.00%
C&I Prescriptive	DCV Single Zone Office with Maintenance [New]	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	0.1120	sq ft	15	104.14%	92.00%	100.00%
C&I Prescriptive	DCV Single Zone Retail with Maintenance [Existing]	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	0.3920	sq ft	15	104.14%	92.00%	100.00%
C&I Prescriptive	DCV Single Zone Retail with Maintenance [New]	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	0.3920	sq ft	15	104.14%	92.00%	100.00%
C&I Prescriptive	Destratification Fan 20 ft [Existing]	Pure	TRM 5.0	2,029.00	unit	15	100.00%	10.00%	100.00%
C&I Prescriptive	Destratification Fan 24 ft [Existing]	Pure	TRM 5.0	2,922.00	unit	15	100.00%	10.00%	100.00%
C&I Prescriptive	Dock Door Seals 10 x 10 (Baseline w/ Deteriorated Seals) [Existing]	Pure	TRM 5.0	1,736.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Dock Door Seals 10 x 10 (Baseline w/o Seals) [Existing]	Pure	TRM 5.0	4,501.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Dock Door Seals 8 x 10 (Baseline w/ Deteriorated Seals) [Existing]	Pure	TRM 5.0	2,041.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Dock Door Seals 8 x 10 (Baseline w/o Seals) [Existing]	Pure	TRM 5.0	5,087.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Dock Door Seals 8 x 8 (Baseline w/ Deteriorated Seals) [Existing]	Pure	TRM 5.0	1,897.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Dock Door Seals 8 x 8 (Baseline w/o Seals) [Existing]	Pure	TRM 5.0	4,853.00	unit	10	100.00%	5.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Prescriptive	Dock Door Seals 8 x 9 (Baseline w/ Deteriorated Seals) [Existing]	Pure	TRM 5.0	1,977.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Dock Door Seals 8 x 9 (Baseline w/o Seals) [Existing]	Pure	TRM 5.0	4,988.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Med Use 65% - 74% (55% Code Baseline) [New/Existing]	Quasi	TRM 5.0	0.4700	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Med Use 75% - 84% (55% Code Baseline) [New/Existing]	Quasi	TRM 5.0	0.9500	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Vent Low Integrated Office 55% (No Baseline) [New]	Quasi	TRM 5.0	1.6000	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Vent Low Integrated School 55% (No Baseline) [New]	Quasi	TRM 5.0	1.6000	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Vent Low Integrated School 65% (No Baseline) [New]	Quasi	TRM 5.0	1.9100	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Vent Low Integrated School 75% (No Baseline) [New]	Quasi	TRM 5.0	2.21	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Vent Low Integrated School 85% (No Baseline) [New]	Quasi	TRM 5.0	2.51	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Vent Low Standalone School 55% (No Baseline) [New]	Quasi	TRM 5.0	1.6000	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Vent Low Standalone School 65% (No Baseline) [New]	Quasi	TRM 5.0	1.9100	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	ERV Vent Low Standalone School 75% (No Baseline) [New]	Quasi	TRM 5.0	2.21	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	HRV Vent Low Integrated School 55% (No Baseline) [New]	Quasi	TRM 5.0	1.3600	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	HRV Vent Low Standalone Office 65% (No Baseline) [New]	Quasi	TRM 5.0	1.6100	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Ind Air Curtain 8 x 10 S&R	Pure	TRM 5.0	4,941.00	unit	15	100.00%	5.00%	100.00%
C&I Prescriptive	Ind Air Curtain Shipping Drive-In Door 12 x 12 [New/Existing]	Pure	TRM 5.0	5,753.00	unit	15	100.00%	5.00%	100.00%
C&I Prescriptive	Ind Destratification Fan 20 ft [Existing]	Pure	TRM 5.0	2,029.00	unit	15	100.00%	10.00%	100.00%
C&I Prescriptive	Ind Destratification Fan 24 ft [Existing]	Pure	TRM 5.0	2,922.00	unit	15	100.00%	10.00%	100.00%
C&I Prescriptive	Ind Dock Door Seals 10 x 10 (Baseline w/ Deteriorated Seals) [Existing]	Pure	TRM 5.0	1,736.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Ind Dock Door Seals 8 x 10 (Baseline w/ Deteriorated Seals) [Existing]	Pure	TRM 5.0	2,041.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Ind Dock Door Seals 8 x 10 (Baseline w/o Seals) [Existing]	Pure	TRM 5.0	5,087.00	unit	10	100.00%	5.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Prescriptive	Ind Dock Door Seals 8 x 8 (Baseline w/ Deteriorated Seals) [Existing]	Pure	TRM 5.0	1,897.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Ind Dock Door Seals 8 x 9 (Baseline w/ Deteriorated Seals) [Existing]	Pure	TRM 5.0	1,977.00	unit	10	100.00%	5.00%	100.00%
C&I Prescriptive	Ozone Washer Extractor =/<60lbs [New]	Quasi	TRM 5.0	0.0383	lbs/yr	15	100.00%	8.00%	100.00%
Home Winterproofing	Bathroom Aerator	Pure	TRM 5.0, TAPS Report	6.40	unit	10	100.00%	0.00%	22.50%
Home Winterproofing	Kitchen Aerator	Pure	TRM 5.0, TAPS Report	11.56	unit	10	100.00%	0.00%	33.50%
Home Winterproofing	Showerhead Replacement 1.25 GPM	Pure	TRM 5.0, Showerhead Verification Study Among Rental Buildings	28.20	unit	10	100.00%	0.00%	87.70%
Home Winterproofing	Smart Thermostats	Pure	TRM 5.0	217.00	unit	15	100.00%	0.00%	100.00%
Home Winterproofing	Smart Thermostats	Pure	TRM 5.0	173.00	unit	15	100.00%	0.00%	100.00%
Home Winterproofing	Smart Thermostats	Pure	TRM 5.0	173.00	unit	15	100.00%	0.00%	100.00%
Home Winterproofing	Smart Thermostats	Pure	TRM 5.0	217.00	unit	15	100.00%	0.00%	100.00%
Low-Income Multi-Residential	Low Income Condensing MUA VFD up to 14,000 CFM - Multi-Residential/Long Term Care [New/Existing]	Quasi	TRM 5.0	3.00	CFM	20	100.00%	0.00%	100.00%
Residential Adaptive Thermostats	Smart Thermostats	Pure	TRM 5.0	173.00	unit	15	100.00%	4.00%	100.00%
Residential Adaptive Thermostats	Smart Thermostats	Pure	TRM 5.0	217.00	unit	15	100.00%	4.00%	100.00%
Residential Adaptive Thermostats	Smart Thermostats	Pure	TRM 5.0	173.00	unit	15	100.00%	4.00%	100.00%
Residential Adaptive Thermostats	Smart Thermostats	Pure	TRM 5.0	217.00	unit	15	100.00%	4.00%	100.00%
Residential Adaptive Thermostats	Smart Thermostats	Pure	TRM 5.0, Adaptive Thermostat Ping Report	185.00	unit	15	100.00%	4.00%	82.52%

*Not all values may compute exactly due to rounding.

Table 11-150. Union measures savings calculation values*

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Direct Install	Air Curtain - Dock-In - 10 x 10	Pure	TRM 5.0	5,517.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Dock-In - 8 x 10	Pure	TRM 5.0	4,941.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Dock-In - 8 x 8	Pure	TRM 5.0	4,713.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Dock-In - 8 x 9	Pure	TRM 5.0	4,845.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 10 x 10	Pure	TRM 5.0	4,844.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 12 x 12	Pure	TRM 5.0	5,753.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 14 x 14	Pure	TRM 5.0	6,504.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 16 x 16	Pure	TRM 5.0	7,081.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 18 x 18	Pure	TRM 5.0	7,459.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Air Curtain - Drive-In - 20 x 20	Pure	TRM 5.0	7,605.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	DCKV- RF - 10,001 to 15,000 cfm	Pure	TRM 5.0	17,529.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	DCKV- RF - 5,001 to 10,000 cfm	Pure	TRM 5.0	10,517.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	DCKV- RF - Up to 5,000 cfm	Pure	TRM 5.0	4,207.00	unit	15	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	5,087.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	2,041.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	1,977.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	1,897.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	4,988.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0	4,853.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Shelter (10x10)	Pure	TRM 5.0	1,736.00	unit	10	100.00%	5.00%	100.00%
C&I Direct Install	Dock Door Seals - Shelter (10x10)	Pure	TRM 5.0	4,501.00	unit	10	100.00%	5.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Prescriptive	Air Curtain - 7 x 3 Door	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	845.00	unit	15	100.00%	50.00%	100.00%
C&I Prescriptive	Air Curtain - 7 x 6 Door	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	1,690.00	unit	15	100.00%	50.00%	100.00%
C&I Prescriptive	Air Curtain - Dock-In - 10 x 10	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	5,517.00	unit	15	100.00%	50.00%	100.00%
C&I Prescriptive	Air Curtain - Dock-In - 8 x 8	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	4,713.00	unit	15	100.00%	50.00%	100.00%
C&I Prescriptive	Air Curtain - Drive-In - 10 x 10	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	4,844.00	unit	15	100.00%	50.00%	100.00%
C&I Prescriptive	Air Curtain - Drive-In - 12 x 12	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	5,753.00	unit	15	100.00%	50.00%	100.00%
C&I Prescriptive	Air Curtain - Drive-In - 16 x 16	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	7,081.00	unit	15	100.00%	50.00%	100.00%
C&I Prescriptive	Commercial Condensing Unit Heater	Quasi	TRM 5.0	7.89	kBTU/hr input capacity	18	100.00%	0.00%	100.00%
C&I Prescriptive	Commercial Condensing Unit Heater	Quasi	TRM 5.0	7.89	kBTU/hr input capacity	18	100.00%	0.00%	100.00%
C&I Prescriptive	Commercial Energy Star Combi Oven	Pure	ENERGY STAR Combination Oven Substantiation Document	1,186.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Energy Star Convection Oven	Pure	TRM 5.0	865.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Energy Star Double Rack Oven	Pure	TRM 5.0	1,076.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Energy Star Fryer	Pure	TRM 5.0	1,408.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Commercial Energy Star Steam Cooker	Pure	TRM 5.0	8,889.00	unit	12	100.00%	20.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 250 kBTU/hr	Quasi	TRM 5.0	1.3600	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 250 kBTU/hr	Quasi	TRM 5.0	3.09	kBTU/hr input capacity	15	100.00%	5.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Prescriptive	Condensing Storage Water Heater - GT 250 kBTU/hr	Quasi	TRM 5.0	2.22	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	Quasi	TRM 5.0	3.09	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	Quasi	TRM 5.0	2.22	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	Quasi	TRM 5.0	1.3600	kBTU/hr input capacity	15	100.00%	5.00%	100.00%
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Mixed	TRM 5.0	212+0.79	unit + kBtu/hr input capacity	20	100.00%	2.00%	100.00%
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Mixed	TRM 5.0	212+1.79	unit + kBtu/hr input capacity	20	100.00%	2.00%	100.00%
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Mixed	TRM 5.0	212+1.29	unit + kBtu/hr input capacity	20	100.00%	2.00%	100.00%
C&I Prescriptive	DCKV- NC - 10,001 to 15,000 cfm	Pure	TRM 5.0	17,529.00	unit	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCKV- NC - 5,001 to 10,000 cfm	Pure	TRM 5.0	10,517.00	unit	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCKV- NC - Up to 5,000 cfm	Pure	TRM 5.0	4,207.00	unit	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCKV- RF - 5,001 to 10,000 cfm	Pure	TRM 5.0	10,517.00	unit	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCKV- RF - Up to 5,000 cfm	Pure	TRM 5.0	4,207.00	unit	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCV	Quasi	TRM 5.0	0.4410	sq ft	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCV	Quasi	TRM 5.0	0.3920	sq ft	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCV	Quasi	TRM 5.0	0.1120	sq ft	15	100.00%	20.00%	100.00%
C&I Prescriptive	DCV	Quasi	TRM 5.0	0.1120	sq ft	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCV	Quasi	TRM 5.0	0.3920	sq ft	15	100.00%	20.00%	100.00%
C&I Prescriptive	DCV	Quasi	TRM 5.0	1.4840	sq ft	15	100.00%	5.00%	100.00%
C&I Prescriptive	DCV	Quasi	TRM 5.0	0.4410	sq ft	15	100.00%	20.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Prescriptive	Destratification Fan - 20ft	Pure	TRM 5.0	2,029.00	unit	15	100.00%	10.00%	100.00%
C&I Prescriptive	Destratification Fan - 20ft	Pure	TRM 5.0	1,472.00	unit	15	100.00%	10.00%	100.00%
C&I Prescriptive	Destratification Fan - 24ft	Pure	TRM 5.0	2,922.00	unit	15	100.00%	10.00%	100.00%
C&I Prescriptive	Destratification Fan - 24ft	Pure	TRM 5.0	2,120.00	unit	15	100.00%	10.00%	100.00%
C&I Prescriptive	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	4,853.00	unit	10	100.00%	50.00%	100.00%
C&I Prescriptive	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	2,041.00	unit	10	100.00%	50.00%	100.00%
C&I Prescriptive	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	5,087.00	unit	10	100.00%	50.00%	100.00%
C&I Prescriptive	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	1,977.00	unit	10	100.00%	50.00%	100.00%
C&I Prescriptive	Dock Door Seals - Compression (8x8 - 8x10)	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	1,897.00	unit	10	100.00%	50.00%	100.00%
C&I Prescriptive	Dock Door Seals - Shelter (10x10)	Pure	TRM 5.0, 2017 C&I Prescriptive Verification Study	1,736.00	unit	10	100.00%	50.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 55% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	1.6000	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 55% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	1.6000	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 65% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	1.9100	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 65% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	1.9100	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 65% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	2.98	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 65% SHR - In-Suite	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	5.37	CFM	14	99.55%	70.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 65% SHR - In-Suite	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	5.37	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 75% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	2.21	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 75% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	2.21	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 75% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	6.22	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 75% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	6.22	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 75% SHR - In-Suite	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	6.22	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 85% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	2.51	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 85% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	2.51	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 85% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	7.07	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-Incremental-GTE 65% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	0.3000	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-Incremental-GTE 75% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	0.6100	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-Incremental-GTE 75% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	0.9500	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Energy Recovery Ventilator (ERV)-Incremental-GTE 85% Sensible Heat Recovery	Quasi	TRM 5.0, 2017 C&I Prescriptive Verification Study	0.9100	CFM	14	99.55%	70.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 55% Sensible Heat Recovery	Quasi	TRM 5.0	1.3600	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 55% Sensible Heat Recovery	Quasi	TRM 5.0	1.3600	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 55% Sensible Heat Recovery	Quasi	TRM 5.0	2.13	CFM	14	100.00%	5.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 55% Sensible Heat Recovery	Quasi	TRM 5.0	3.84	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 65% Sensible Heat Recovery	Quasi	TRM 5.0	2.52	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 65% Sensible Heat Recovery	Quasi	TRM 5.0	4.54	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 65% Sensible Heat Recovery	Quasi	TRM 5.0	1.6100	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 65% Sensible Heat Recovery	Quasi	TRM 5.0	1.6100	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 85% Sensible Heat Recovery	Quasi	TRM 5.0	5.93	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 85% Sensible Heat Recovery	Quasi	TRM 5.0	2.11	CFM	14	100.00%	5.00%	100.00%
C&I Prescriptive	Make-Up Air Unit (MUA) - VFD	Quasi	TRM 5.0	3.00	CFM	20	100.00%	5.00%	100.00%
C&I Prescriptive	Make-Up Air Unit (MUA) - VFD	Quasi	TRM 5.0	2.03	CFM	20	100.00%	5.00%	100.00%
C&I Prescriptive	Ozone Laundry - Washer Extractor	Quasi	TRM 5.0	0.0383	lbs/yr	15	100.00%	8.00%	100.00%
C&I Prescriptive	Ozone Laundry - Washer Extractor	Quasi	TRM 5.0	0.0383	lbs/yr	15	100.00%	8.00%	100.00%
Home Weatherization	Bathroom Aerator 1.0 gpm	Pure	TRM 5.0, Low Income Kits Verification Study	6.40	unit	10	100.00%	1.00%	86.10%
Home Weatherization	Kitchen Aerator 1.5 gpm	Pure	TRM 5.0, Low Income Kits Verification Study	11.56	unit	10	100.00%	1.00%	81.20%
Home Weatherization	Pipe Insulation - 2 metres	Pure	TRM 5.0, Low Income Kits Verification Study	3.64	ft	15	100.00%	1.00%	93.90%
Home Weatherization	Showerhead Replacement 1.25 GPM	Pure	TRM 5.0, Low Income Kits Verification Study	28.20	unit	10	100.00%	1.00%	79.90%
Home Weatherization	Smart Thermostats	Pure	TRM 5.0	173.00	unit	15	100.00%	1.00%	100.00%
Home Weatherization	Smart Thermostats	Pure	TRM 5.0	173.00	unit	15	100.00%	1.00%	100.00%
Home Weatherization	Smart Thermostats	Pure	TRM 5.0	217.00	unit	15	100.00%	1.00%	100.00%
Home Weatherization	Smart Thermostats	Pure	TRM 5.0	217.00	unit	15	100.00%	1.00%	100.00%
Multi-family	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Mixed	TRM 5.0	212+1.79	unit + kBtu/hr input capacity	20	100.00%	2.00%	100.00%
Multi-family	Energy Recovery Ventilator (ERV)-GTE 75% Sensible Heat Recovery-LI	Quasi	TRM 5.0	6.22	CFM	14	100.00%	5.00%	100.00%

Program	Measure	Pure or Quasi	Source	Savings Factor (m^3)	Unit	EUL	Gross Realization Rate	Free Ridership	Adjustment Factor
Multi-family	Energy Recovery Ventilator (ERV)-GTE 85% Sensible Heat Recovery-LI	Quasi	TRM 5.0	7.07	CFM	14	100.00%	5.00%	100.00%
Multi-family	Energy Recovery Ventilator (ERV)-GTE 85% SHR - In-Suite-LI	Quasi	TRM 5.0	7.07	CFM	14	100.00%	5.00%	100.00%
Multi-family	Heat Recovery Ventilator (HRV)-GTE 65% Sensible Heat Recovery-LI	Quasi	TRM 5.0	4.54	CFM	14	100.00%	5.00%	100.00%
Multi-family	Make-Up Air Unit (MUA) - VFD	Quasi	TRM 5.0	3.00	CFM	20	100.00%	5.00%	100.00%
Residential Adaptive Thermostats	Smart Thermostats	Pure	TRM 5.0	217.00	unit	15	100.00%	4.00%	100.00%
Residential Adaptive Thermostats	Smart Thermostats	Pure	TRM 5.0	173.00	unit	15	100.00%	4.00%	100.00%
Residential Adaptive Thermostats	Smart Thermostats	Pure	TRM 5.0, Adaptive Thermostat Ping Report	185.00	unit	15	100.00%	4.00%	84.19%

*Not all values may compute exactly due to rounding.

11.13.4 Savings Calculation Measure Totals

Table 11-151. Enbridge Measure Savings, Tracked and Verified, by Annual and Cumulative, Gross and Net*

Program	Measure	Tracked				Verified			
		Annual		Cumulative		Annual		Cumulative	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
C&I Direct Install	Air Curtain - Dock-In - 10 x 10	82,755	78,617	1,241,325	1,179,259	82,755	78,617	1,241,325	1,179,259
C&I Direct Install	Air Curtain - Dock-In - 8 x 10	232,227	220,616	3,483,405	3,309,235	232,227	220,616	3,483,405	3,309,235
C&I Direct Install	Air Curtain - Dock-In - 8 x 8	89,547	85,070	1,343,205	1,276,045	89,547	85,070	1,343,205	1,276,045
C&I Direct Install	Air Curtain - Drive-In - 10 x 10	130,788	124,249	1,961,820	1,863,729	130,788	124,249	1,961,820	1,863,729
C&I Direct Install	Air Curtain - Drive-In - 12 x 12	356,686	338,852	5,350,290	5,082,776	356,686	338,852	5,350,290	5,082,776
C&I Direct Install	Air Curtain - Drive-In - 14 x 14	234,144	222,437	3,512,160	3,336,552	234,144	222,437	3,512,160	3,336,552
C&I Direct Install	Air Curtain - Drive-In - 16 x 16	56,648	53,816	849,720	807,234	56,648	53,816	849,720	807,234
C&I Direct Install	Air Curtain - Drive-In - 18 x 18	7,459	7,086	111,885	106,291	7,459	7,086	111,885	106,291
C&I Direct Install	Air Curtain - Drive-In - 20 x 20	15,210	14,450	228,150	216,743	15,210	14,450	228,150	216,743
C&I Direct Install	DCKV- RF - 10,001 to 15,000 cfm	87,645	83,263	1,314,675	1,248,941	87,645	83,263	1,314,675	1,248,941
C&I Direct Install	DCKV- RF - 5,001 to 10,000 cfm	147,238	139,876	2,208,570	2,098,142	147,238	139,876	2,208,570	2,098,142
C&I Direct Install	DCKV- RF - Up to 5,000 cfm	25,242	23,980	378,630	359,699	25,242	23,980	378,630	359,699
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	1,095,421	1,040,650	10,954,210	10,406,500	1,095,421	1,040,650	10,954,210	10,406,500
C&I Direct Install	Dock Door Seals - Shelter (10x10)	72,464	68,841	724,640	688,408	72,464	68,841	724,640	688,408
C&I Prescriptive	Commercial Condensing Unit Heater	16,001	16,001	288,017	288,017	16,001	16,001	288,017	288,017
C&I Prescriptive	Commercial Energy Star Combi Oven	7,116	5,693	85,392	68,314	7,116	5,693	85,392	68,314
C&I Prescriptive	Commercial Energy Star Convection Oven	50,170	40,136	602,040	481,632	50,170	40,136	602,040	481,632
C&I Prescriptive	Commercial Energy Star Double Rack Oven	21,520	17,216	258,240	206,592	21,520	17,216	258,240	206,592
C&I Prescriptive	Commercial Energy Star Fryer	725,120	580,096	8,701,440	6,961,152	725,120	580,096	8,701,440	6,961,152
C&I Prescriptive	Commercial Energy Star Steam Cooker	44,445	35,556	533,340	426,672	44,445	35,556	533,340	426,672

Program	Measure	Tracked				Verified			
		Annual		Cumulative		Annual		Cumulative	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
C&I Prescriptive	Commercial Under-Fired Broiler	2,511	2,009	30,132	24,106	2,511	2,009	30,132	24,106
C&I Prescriptive	Condensing MUA VFD up to 14,000 CFM - Multi-Residential/Long Term Care [New/Existing]	12,000	11,400	240,000	228,000	12,000	11,400	240,000	228,000
C&I Prescriptive	Condensing Storage Water Heater - GT 250 kBTU/hr	20,348	19,330	305,217	289,956	20,348	19,330	305,217	289,956
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	47,825	45,434	717,381	681,512	47,825	45,434	717,382	681,513
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	21,684	21,251	433,689	425,015	21,684	21,251	433,689	425,015
C&I Prescriptive	DCKV 10,001 - 15,000 CFM [New]	18,009	11,166	270,139	167,486	18,009	11,166	270,139	167,486
C&I Prescriptive	DCKV 5,001 - 10,000 CFM [Existing]	118,857	73,691	1,782,852	1,105,368	118,857	73,691	1,782,852	1,105,368
C&I Prescriptive	DCKV 5,001 - 10,000 CFM [New]	10,805	6,699	162,077	100,488	10,805	6,699	162,077	100,488
C&I Prescriptive	DCKV up to 5,000 CFM [New]	21,611	13,399	324,170	200,986	21,611	13,399	324,170	200,986
C&I Prescriptive	DCKV up to 5000 CFM [Existing]	90,768	56,276	1,361,516	844,140	90,768	56,276	1,361,516	844,140
C&I Prescriptive	DCV Single Zone Office with Maintenance [Existing]	15,742	1,259	236,127	18,890	15,742	1,259	236,127	18,890
C&I Prescriptive	DCV Single Zone Office with Maintenance [New]	512	41	7,686	615	512	41	7,686	615
C&I Prescriptive	DCV Single Zone Retail with Maintenance [Existing]	15,106	1,208	226,583	18,127	15,106	1,208	226,583	18,127
C&I Prescriptive	DCV Single Zone Retail with Maintenance [New]	182,197	14,576	2,732,956	218,637	182,197	14,576	2,732,956	218,637
C&I Prescriptive	Destratification Fan 20 ft [Existing]	6,087	5,478	91,305	82,175	6,087	5,478	91,305	82,175
C&I Prescriptive	Destratification Fan 24 ft [Existing]	81,816	73,634	1,227,240	1,104,516	81,816	73,634	1,227,240	1,104,516
C&I Prescriptive	Dock Door Seals 10 x 10 (Baseline w/ Deteriorated Seals) [Existing]	78,120	74,214	781,200	742,140	78,120	74,214	781,200	742,140
C&I Prescriptive	Dock Door Seals 10 x 10 (Baseline w/o Seals) [Existing]	40,509	38,484	405,090	384,836	40,509	38,484	405,090	384,836

Program	Measure	Tracked				Verified			
		Annual		Cumulative		Annual		Cumulative	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
C&I Prescriptive	Dock Door Seals 8 x 10 (Baseline w/ Deteriorated Seals) [Existing]	626,587	595,258	6,265,870	5,952,577	626,587	595,258	6,265,870	5,952,577
C&I Prescriptive	Dock Door Seals 8 x 10 (Baseline w/o Seals) [Existing]	615,527	584,751	6,155,270	5,847,507	615,527	584,751	6,155,270	5,847,507
C&I Prescriptive	Dock Door Seals 8 x 8 (Baseline w/ Deteriorated Seals) [Existing]	220,052	209,049	2,200,520	2,090,494	220,052	209,049	2,200,520	2,090,494
C&I Prescriptive	Dock Door Seals 8 x 8 (Baseline w/o Seals) [Existing]	24,265	23,052	242,650	230,518	24,265	23,052	242,650	230,518
C&I Prescriptive	Dock Door Seals 8 x 9 (Baseline w/ Deteriorated Seals) [Existing]	23,724	22,538	237,240	225,378	23,724	22,538	237,240	225,378
C&I Prescriptive	Dock Door Seals 8 x 9 (Baseline w/o Seals) [Existing]	29,928	28,432	299,280	284,316	29,928	28,432	299,280	284,316
C&I Prescriptive	ERV Med Use 65% - 74% (55% Code Baseline) [New/Existing]	3,055	2,902	42,770	40,632	3,055	2,902	42,770	40,632
C&I Prescriptive	ERV Med Use 75% - 84% (55% Code Baseline) [New/Existing]	2,090	1,986	29,260	27,797	2,090	1,986	29,260	27,797
C&I Prescriptive	ERV Vent Low Integrated Office 55% (No Baseline) [New]	2,240	2,128	31,360	29,792	2,240	2,128	31,360	29,792
C&I Prescriptive	ERV Vent Low Integrated School 55% (No Baseline) [New]	4,800	4,560	67,200	63,840	4,800	4,560	67,200	63,840
C&I Prescriptive	ERV Vent Low Integrated School 65% (No Baseline) [New]	73,258	69,595	1,025,613	974,332	73,258	69,595	1,025,613	974,332
C&I Prescriptive	ERV Vent Low Integrated School 75% (No Baseline) [New]	28,418	26,997	397,857	377,965	28,418	26,997	397,857	377,965
C&I Prescriptive	ERV Vent Low Integrated School 85% (No Baseline) [New]	5,020	4,769	70,280	66,766	5,020	4,769	70,280	66,766
C&I Prescriptive	ERV Vent Low Standalone School 55% (No Baseline) [New]	35,200	33,440	492,800	468,160	35,200	33,440	492,800	468,160
C&I Prescriptive	ERV Vent Low Standalone School 65% (No Baseline) [New]	4,584	4,355	64,176	60,967	4,584	4,355	64,176	60,967
C&I Prescriptive	ERV Vent Low Standalone School 75% (No Baseline) [New]	884	840	12,376	11,757	884	840	12,376	11,757
C&I Prescriptive	HRV Vent Low Integrated School 55% (No Baseline) [New]	6,392	6,072	89,488	85,014	6,392	6,072	89,488	85,014

Program	Measure	Tracked				Verified			
		Annual		Cumulative		Annual		Cumulative	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
C&I Prescriptive	HRV Vent Low Standalone Office 65% (No Baseline) [New]	122,360	116,242	1,713,040	1,627,388	122,360	116,242	1,713,040	1,627,388
C&I Prescriptive	Ind Air Curtain 8 x 10 S&R	9,882	9,388	148,230	140,819	9,882	9,388	148,230	140,819
C&I Prescriptive	Ind Air Curtain Shipping Drive-In Door 12 x 12 [New/Existing]	11,506	10,931	172,590	163,961	11,506	10,931	172,590	163,961
C&I Prescriptive	Ind Destratification Fan 20 ft [Existing]	4,058	3,652	60,870	54,783	4,058	3,652	60,870	54,783
C&I Prescriptive	Ind Destratification Fan 24 ft [Existing]	40,908	36,817	613,620	552,258	40,908	36,817	613,620	552,258
C&I Prescriptive	Ind Dock Door Seals 10 x 10 (Baseline w/ Deteriorated Seals) [Existing]	59,024	56,073	590,240	560,728	59,024	56,073	590,240	560,728
C&I Prescriptive	Ind Dock Door Seals 8 x 10 (Baseline w/ Deteriorated Seals) [Existing]	89,804	85,314	898,040	853,138	89,804	85,314	898,040	853,138
C&I Prescriptive	Ind Dock Door Seals 8 x 10 (Baseline w/o Seals) [Existing]	15,261	14,498	152,610	144,980	15,261	14,498	152,610	144,980
C&I Prescriptive	Ind Dock Door Seals 8 x 8 (Baseline w/ Deteriorated Seals) [Existing]	1,897	1,802	18,970	18,022	1,897	1,802	18,970	18,022
C&I Prescriptive	Ind Dock Door Seals 8 x 9 (Baseline w/ Deteriorated Seals) [Existing]	25,701	24,416	257,010	244,160	25,701	24,416	257,010	244,160
C&I Prescriptive	Ozone Washer Extractor =/<60lbs [New]	145,666	134,013	2,184,990	2,010,191	145,666	134,013	2,184,990	2,010,191
Home Winterproofing	Bathroom Aerator	661	661	6,610	6,610	661	661	6,610	6,610
Home Winterproofing	Kitchen Aerator	1,247	1,247	12,470	12,470	1,247	1,247	12,470	12,470
Home Winterproofing	Showerhead Replacement 1.25 GPM	10,610	10,610	106,098	106,098	10,610	10,610	106,098	106,098
Home Winterproofing	Smart Thermostats	355,369	355,369	5,330,535	5,330,535	355,369	355,369	5,330,535	5,330,535
Low-Income Multi-Residential	Low Income Condensing MUA VFD up to 14,000 CFM - Multi-Residential/Long Term Care [New/Existing]	63,150	63,150	1,263,000	1,263,000	63,150	63,150	1,263,000	1,263,000
Residential Adaptive Thermostats	Smart Thermostats	3,714,106	3,565,542	55,711,591	53,483,128	3,714,106	3,565,542	55,711,591	53,483,128

*Not all values may compute exactly due to rounding.

Table 11-152. Union Measure Savings, Tracked and Verified, by Annual and Cumulative, Gross and Net*

Program	Measure	Tracked				Verified			
		Annual		Cumulative		Annual		Cumulative	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
C&I Direct Install	Air Curtain - Dock-In - 10 x 10	33,102	31,447	496,530	471,704	33,102	31,447	496,530	471,704
C&I Direct Install	Air Curtain - Dock-In - 8 x 10	83,997	79,797	1,259,955	1,196,957	83,997	79,797	1,259,955	1,196,957
C&I Direct Install	Air Curtain - Dock-In - 8 x 8	32,991	31,341	494,865	470,122	32,991	31,341	494,865	470,122
C&I Direct Install	Air Curtain - Dock-In - 8 x 9	33,915	32,219	508,725	483,289	33,915	32,219	508,725	483,289
C&I Direct Install	Air Curtain - Drive-In - 10 x 10	53,284	50,620	799,260	759,297	53,284	50,620	799,260	759,297
C&I Direct Install	Air Curtain - Drive-In - 12 x 12	178,343	169,426	2,675,145	2,541,388	178,343	169,426	2,675,145	2,541,388
C&I Direct Install	Air Curtain - Drive-In - 14 x 14	214,632	203,900	3,219,480	3,058,506	214,632	203,900	3,219,480	3,058,506
C&I Direct Install	Air Curtain - Drive-In - 16 x 16	177,025	168,174	2,655,375	2,522,606	177,025	168,174	2,655,375	2,522,606
C&I Direct Install	Air Curtain - Drive-In - 18 x 18	52,213	49,602	783,195	744,035	52,213	49,602	783,195	744,035
C&I Direct Install	Air Curtain - Drive-In - 20 x 20	15,210	14,450	228,150	216,743	15,210	14,450	228,150	216,743
C&I Direct Install	DCKV- RF - 10,001 to 15,000 cfm	70,116	66,610	1,051,740	999,153	70,116	66,610	1,051,740	999,153
C&I Direct Install	DCKV- RF - 5,001 to 10,000 cfm	52,585	49,956	788,775	749,336	52,585	49,956	788,775	749,336
C&I Direct Install	DCKV- RF - Up to 5,000 cfm	8,414	7,993	126,210	119,900	8,414	7,993	126,210	119,900
C&I Direct Install	Dock Door Seals - Compression (8x8 - 8x10)	378,175	359,266	3,781,750	3,592,663	378,175	359,266	3,781,750	3,592,663
C&I Direct Install	Dock Door Seals - Shelter (10x10)	50,281	47,767	502,810	477,670	50,281	47,767	502,810	477,670
C&I Prescriptive	Air Curtain - 7 x 3 Door	1,690	845	25,350	12,675	1,690	845	25,350	12,675
C&I Prescriptive	Air Curtain - 7 x 6 Door	6,760	3,380	101,400	50,700	6,760	3,380	101,400	50,700
C&I Prescriptive	Air Curtain - Dock-In - 10 x 10	11,034	5,517	165,510	82,755	11,034	5,517	165,510	82,755
C&I Prescriptive	Air Curtain - Dock-In - 8 x 8	4,713	2,357	70,695	35,348	4,713	2,357	70,695	35,348
C&I Prescriptive	Air Curtain - Drive-In - 10 x 10	4,844	2,422	72,660	36,330	4,844	2,422	72,660	36,330
C&I Prescriptive	Air Curtain - Drive-In - 12 x 12	5,753	2,877	86,295	43,148	5,753	2,877	86,295	43,148

Program	Measure	Tracked				Verified			
		Annual		Cumulative		Annual		Cumulative	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
C&I Prescriptive	Air Curtain - Drive-In - 16 x 16	14,162	7,081	212,430	106,215	14,162	7,081	212,430	106,215
C&I Prescriptive	Commercial Condensing Unit Heater	7,811	7,811	140,600	140,600	7,811	7,811	140,600	140,600
C&I Prescriptive	Commercial Energy Star Combi Oven	8,302	6,642	99,624	79,699	8,302	6,642	99,624	79,699
C&I Prescriptive	Commercial Energy Star Convection Oven	23,355	18,684	280,260	224,208	23,355	18,684	280,260	224,208
C&I Prescriptive	Commercial Energy Star Double Rack Oven	17,216	13,773	206,592	165,274	17,216	13,773	206,592	165,274
C&I Prescriptive	Commercial Energy Star Fryer	399,872	319,898	4,798,464	3,838,771	399,872	319,898	4,798,464	3,838,771
C&I Prescriptive	Commercial Energy Star Steam Cooker	17,778	14,222	213,336	170,669	17,778	14,222	213,336	170,669
C&I Prescriptive	Condensing Storage Water Heater - GT 250 kBTU/hr	35,058	33,305	525,863	499,570	35,058	33,305	525,863	499,570
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	47,999	45,599	719,984	683,984	47,999	45,599	719,984	683,985
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	30,731	30,117	614,625	602,332	30,731	30,117	614,626	602,333
C&I Prescriptive	DCKV- NC - 10,001 to 15,000 cfm	17,529	16,653	262,935	249,788	17,529	16,653	262,935	249,788
C&I Prescriptive	DCKV- NC - 5,001 to 10,000 cfm	21,034	19,982	315,510	299,735	21,034	19,982	315,510	299,735
C&I Prescriptive	DCKV- NC - Up to 5,000 cfm	54,691	51,956	820,365	779,347	54,691	51,956	820,365	779,347
C&I Prescriptive	DCKV- RF - 5,001 to 10,000 cfm	52,585	49,956	788,775	749,336	52,585	49,956	788,775	749,336
C&I Prescriptive	DCKV- RF - Up to 5,000 cfm	63,105	59,950	946,575	899,246	63,105	59,950	946,575	899,246
C&I Prescriptive	DCV	441,728	416,872	6,625,917	6,253,081	441,728	416,872	6,625,918	6,253,081
C&I Prescriptive	Destratification Fan - 20ft	25,820	23,238	387,300	348,570	25,820	23,238	387,300	348,570
C&I Prescriptive	Destratification Fan - 24ft	31,284	28,156	469,260	422,334	31,284	28,156	469,260	422,334
C&I Prescriptive	Dock Door Seals - Compression (8x8 - 8x10)	291,219	145,610	2,912,190	1,456,095	291,219	145,610	2,912,190	1,456,095
C&I Prescriptive	Dock Door Seals - Shelter (10x10)	154,504	77,252	1,545,040	772,520	154,504	77,252	1,545,040	772,520

Program	Measure	Tracked				Verified			
		Annual		Cumulative		Annual		Cumulative	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 55% Sensible Heat Recovery	109,083	32,725	1,527,161	458,148	109,083	32,725	1,527,161	458,148
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 65% Sensible Heat Recovery	305,720	91,716	4,280,076	1,284,023	305,720	91,716	4,280,076	1,284,023
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 65% SHR - In-Suite	226,690	68,007	3,173,662	952,099	226,690	68,007	3,173,662	952,099
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 75% Sensible Heat Recovery	329,699	98,910	4,615,791	1,384,737	329,699	98,910	4,615,791	1,384,737
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 75% SHR - In-Suite	20,434	6,130	286,071	85,821	20,434	6,130	286,071	85,821
C&I Prescriptive	Energy Recovery Ventilator (ERV)-GTE 85% Sensible Heat Recovery	150,675	45,203	2,109,452	632,836	150,675	45,203	2,109,452	632,836
C&I Prescriptive	Energy Recovery Ventilator (ERV)-Incremental-GTE 65% Sensible Heat Recovery	5,311	1,593	74,361	22,308	5,311	1,593	74,361	22,308
C&I Prescriptive	Energy Recovery Ventilator (ERV)-Incremental-GTE 75% Sensible Heat Recovery	4,797	1,439	67,159	20,148	4,797	1,439	67,159	20,148
C&I Prescriptive	Energy Recovery Ventilator (ERV)-Incremental-GTE 85% Sensible Heat Recovery	8,878	2,663	124,290	37,287	8,878	2,663	124,290	37,287
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 55% Sensible Heat Recovery	36,407	34,587	509,699	484,214	36,407	34,587	509,699	484,214
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 65% Sensible Heat Recovery	46,770	44,431	654,779	622,040	46,770	44,431	654,779	622,040
C&I Prescriptive	Heat Recovery Ventilator (HRV)-GTE 85% Sensible Heat Recovery	2,030	1,929	28,420	26,999	2,030	1,929	28,420	26,999
C&I Prescriptive	Make-Up Air Unit (MUA) - VFD	239,043	227,091	4,780,868	4,541,825	239,043	227,091	4,780,868	4,541,825
C&I Prescriptive	Ozone Laundry - Washer Extractor	45,294	41,670	679,404	625,051	45,294	41,670	679,404	625,051
Home Weatherization	Bathroom Aerator 1.0 gpm	1,069	1,058	10,690	10,583	1,069	1,058	10,690	10,583
Home Weatherization	Kitchen Aerator 1.5 gpm	2,309	2,286	23,091	22,860	2,309	2,286	23,091	22,860

Program	Measure	Tracked				Verified			
		Annual		Cumulative		Annual		Cumulative	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
Home Weatherization	Pipe Insulation - 2 metres	6,705	6,638	100,569	99,563	6,705	6,638	100,569	99,563
Home Weatherization	Showerhead Replacement 1.25 GPM	4,889	4,841	48,894	48,405	4,889	4,841	48,894	48,405
Home Weatherization	Smart Thermostats	424,732	420,485	6,370,980	6,307,270	424,732	420,485	6,370,980	6,307,270
Multi-family	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	1,136	1,114	22,728	22,274	1,136	1,114	22,728	22,274
Multi-family	Energy Recovery Ventilator (ERV)-GTE 75% Sensible Heat Recovery-LI	1,244	1,182	17,416	16,545	1,244	1,182	17,416	16,545
Multi-family	Energy Recovery Ventilator (ERV)-GTE 85% Sensible Heat Recovery-LI	99,051	94,098	1,386,710	1,317,374	99,051	94,098	1,386,710	1,317,374
Multi-family	Energy Recovery Ventilator (ERV)-GTE 85% SHR - In-Suite-LI	2,771	2,633	38,800	36,860	2,771	2,633	38,800	36,860
Multi-family	Heat Recovery Ventilator (HRV)-GTE 65% Sensible Heat Recovery-LI	121,581	115,502	1,702,137	1,617,030	121,581	115,502	1,702,137	1,617,030
Multi-family	Make-Up Air Unit (MUA) - VFD	67,221	63,860	1,344,420	1,277,199	67,221	63,860	1,344,420	1,277,199
Residential Adaptive Thermostats	Smart Thermostats	1,609,955	1,545,557	24,149,329	23,183,355	1,609,955	1,545,557	24,149,329	23,183,355

*Not all values may compute exactly due to rounding.

11.13.5 Savings Verification Discrepancies

Table 11-153. Enbridge measure verification discrepancies

Program	Measure	Issue	Resolution	Tracked Cumulative Gross Savings	Tracked Cumulative Net Savings	Verified Cumulative Gross Savings	Verified Cumulative Net Savings
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Rounding.	-	433,689	425,015	433,689	425,015

Table 11-154. Union measure verification discrepancies

Program	Measure	Issue	Resolution	Tracked Cumulative Gross Savings	Tracked Cumulative Net Savings	Verified Cumulative Gross Savings	Verified Cumulative Net Savings
C&I Prescriptive	Condensing Storage Water Heater - GT 75 & LTE 250 kBTU/Hr	Rounding.	-	719,984	683,984	719,984	683,985
C&I Prescriptive	Condensing Tankless Water Heater - GT 75 & LT 200 kBTU/hr	Rounding.	-	614,625	602,332	614,626	602,333

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11.14 Appendix N: Program Spending Tables

Table 11-155. Enbridge 2021 approved and spent budget*

Scorecard/Program	OEB-Approved Budget	Utility Spending	Difference	
			$	%
Resource Acquisition Total	**$42,908,517**	**$49,430,837**	**$6,522,320**	**15%**
Home Energy Conservation	$18,727,200	$29,560,475	$10,833,275	58%
Residential Adaptive Thermostats	$2,262,870	$2,312,755	$49,885	2%
C&I Custom	$7,658,968	$6,772,836	-$886,132	-12%
C&I Direct Install	$4,950,581	$2,909,245	-$2,041,337	-41%
C&I Prescriptive	$2,323,114	$2,438,956	$115,842	5%
Energy Leaders Initiative	$0	$251,175	$251,175	-
Run it Right (RA Portion)	$1,653,979	$225,192	-$1,428,787	-86%
Comprehensive Energy Management (RA portion)	$98,838	$19,183	-$79,655	-81%
Resource Acquisition Overhead	$5,232,967	$4,941,020	-$291,947	-6%
Low Income Total	**$13,849,850**	**$13,427,553**	**-$422,297**	**-3%**
Home Winterproofing	$6,736,859	$6,818,367	$81,508	1%
Low Income Multi Residential	$3,967,353	$3,473,475	-$493,878	-12%
Low Income New Construction	$1,456,560	$1,540,866	$84,306	6%
Low Income Overhead	$1,689,078	$1,594,845	-$94,233	-6%
Market Transformation Total	**$7,181,118**	**$5,586,083**	**-$1,595,035**	**-22%**
Residential Savings by Design	$3,392,296	$3,809,618	$417,322	12%
Commercial Savings by Design	$1,122,068	$604,724	-$517,344	-46%
Run it Right (MTEM portion)	$329,209	$244,172	-$85,038	-26%
Comprehensive Energy Management (MTEM portion)	$941,562	$100,646	-$840,916	-89%
School Energy Competition	$520,200	$0	-$520,200	-100%
Market Transformation Overhead	$875,783	$826,923	-$48,860	-6%
Portfolio Overhead	**$3,817,891**	**$1,175,308**	**-$2,642,583**	**-69%**
Process and Program Evaluation	$1,774,228	$518,568	-$1,255,660	-71%
DSM IT Chargeback**	$1,000,000	$0	-$1,000,000	-100%
Collaboration and Innovation**	$1,043,663	$656,740	-$386,923	-37%
Enbridge Total	**$67,757,376**	**$69,619,780**	**$1,862,404**	**3%**

*Not all values may compute exactly due to rounding.
**These line items are collapsed into the Other category in Table 9-2.

Table 11-156. Union 2021 approved and spent budget*

Scorecard/Program	OEB-Approved Budget	Utility Spending	Difference	
			$	%
Resource Acquisition Total	**$36,310,983**	**$31,447,736**	**-$4,863,247**	**-13%**
Resource Acquisition - Residential	$13,907,697	$14,252,979	$345,282	2%
Home Reno Rebate	$12,226,000	$11,528,676	-$697,324	-6%
Residential Adaptive Thermostats	$0	$1,177,701	$1,177,701	-
Residential Overhead	$1,681,697	$1,546,602	-$135,095	-8%
Resource Acquisition - C&I	$22,403,286	$17,194,757	-$5,208,529	-23%
C&I Custom	$7,808,000	$9,244,820	$1,436,820	18%
C&I Direct Install	$2,500,000	$1,897,957	-$602,043	-24%
C&I Prescriptive	$7,149,000	$2,264,922	-$4,884,078	-68%
C&I Overhead	$4,946,286	$3,787,057	-$1,159,229	-23%
Low Income Total	**$15,005,488**	**$11,966,434**	**-$3,039,054**	**-20%**
Home Weatherization	$8,374,000	$8,398,589	$24,589	<1%
Furnace End-of-Life	$917,000	$0	-$917,000	-100%
Indigenous	$448,000	$71,444	-$376,556	-84%
Multi-Family	$3,573,000	$2,566,630	-$1,006,370	-28%
Low Income Overhead	$1,693,488	$929,771	-$763,717	-45%
Large Volume Total	**$4,000,000**	**$2,729,314**	**-$1,270,686**	**-32%**
Large Volume	$3,150,000	$2,329,797	-$820,203	-26%
Large Volume Overhead	$850,000	$399,516	-$450,484	-53%
Market Transformation Total	**$2,338,070**	**$1,453,549**	**-$884,521**	**-38%**
Optimum Home	$841,000	$63,077	-$777,923	-92%
Commercial New Construction	$1,000,000	$816,326	-$183,674	-18%
Market Transformation Overhead	$497,070	$574,146	$77,076	16%
Performance Based Total	**$1,053,000**	**$166,436**	**-$886,564**	**-84%**
RunSmart	$163,000	$27,405	-$135,595	-83%
Strategic Energy Management	$639,000	$86,438	-$552,563	-86%
Performance-Based Overhead	$251,000	$52,593	-$198,407	-79%
Portfolio Overhead	**$5,642,000**	**$5,213,456**	**-$428,544**	**-8%**
Research	$1,000,000	$1,010,783	$10,783	1%
Evaluation	$1,300,000	$347,084	-$952,916	-73%
Administration	$2,842,000	$3,442,573	$600,573	21%
Pilots**	$500,000	$413,090	-$86,910	-17%
Open Bill Project**	$0	($72)	-$72	-
Union Total	**$64,349,541**	**$52,976,925**	**-$11,372,617**	**-18%**

*Not all values may compute exactly due to rounding.
**These line items are collapsed into the Other category in Table 9-7.

11.15 Appendix O: Cost Effectiveness Methodology

11.15.1 Cost Effectiveness Overview

The OEB requires the utilities to deliver portfolios that are cost effective at the "program" level. Each utility defines "program" differently, and both utilities define "program" differently from the OEB, as shown in Table 11-157. Throughout this report, the uses the OEB-defined Programs. The relevant cost effectiveness results are based on the utilities' definition of program.

Table 11-157: 2021 "Programs" as defined by the OEB, Enbridge, and Union

Utility-Defined Programs	OEB-Defined Programs
Enbridge	
Resource Acquisition	Home Energy Conservation
	Residential Adaptive Thermostats
	Commercial and Industrial Custom
	Commercial and Industrial Direct Install
	Commercial and Industrial Prescriptive
	Comprehensive Energy Management
	Run it Right
Low Income	Home Winterproofing
	Multi-Residential
Market Transformation	Residential Savings by Design
	Commercial Savings by Design
	School Energy Competition
	Run it Right
	Comprehensive Energy Management
Union	
Residential Resource Acquisition	Home Reno Rebate
	Residential Adaptive Thermostats
C&I Resource Acquisition	Commercial and Industrial Custom
	Commercial and Industrial Direct Install
	Commercial and Industrial Prescriptive
Low Income	Home Weatherization
	Indigenous
	Furnace End of Life
	Low Income Multi-Family
Large Volume	Large Volume
Market Transformation	Optimum Home
	Commercial New Construction
Performance Based	RunSmart
	Strategic Energy Management

To calculate cost effectiveness, the EC used the cost effectiveness model that has been applied in previous years using the utilities' verified savings, with one notable change (details below).

The key inputs used to calculate the TRC-Plus and PAC tests are shown in Table 11-158

Table 11-158: Key inputs used in the TRC-Plus and PAC tests

Input	Description	TRC	PAC
Overhead & Administration Costs	Fixed costs, including overhead & administration, program management, program support, enabling strategies (communications, marketing, and outreach) done by utilities, costs, and fees for service (e.g., data management, contractor management).	✓	✓
Utility Incentives	Utility provided incentives to encourage adoption of efficiency measures.	✓	✓
Promotion Costs	Variable expenditures to deliver and promote programs.	✓	✓
Evaluation Costs	Expenditures associated with evaluation of programs at the scorecard level.		
Participant Cost	The incremental cost to the participant after subtracting any program rebates.	✓	
Discount Rate	Discount rate used to weight long-term versus short-term benefits provided by the utilities (nominal discount rate of 6.08%).	✓	✓
Net Savings	Savings net of free rider and spillover effects.	✓	✓
Avoided Costs	Utility- avoided costs related to generation and distribution of energy from natural gas lines. Avoided Costs were provided by the utilities (see Section 11.15.3).	✓	✓
Measure EUL	See glossary.	✓	✓
Non-Energy Benefits	A 15% non-energy benefit (NEB) adder is applied to gas, electricity and water avoided costs representing environmental, economic, and health-related externalities.	✓	
Cost of Carbon	The avoided costs of carbon expressed as dollars per m^3 based on established annual carbon pricing increases of $15/tonne from 2023 to 2030. Beyond 2030, a 2% inflation rate for remaining years. See Table 11-163 and Table 11-165 below.	✓	✓

The cost effectiveness model had two main goals, including:

- Using a comprehensive model that can be easily modified to assess the impact of changing assumptions and methodology to calculate the TRC-Plus and PAC tests
- Ensuring consistent cost effectiveness calculations by regrouping both utilities in the same model

The EC model was modified to adjust gross savings using realization rates and free ridership and spillover from the annual savings verification activities. Because the realization rates for other savings (e.g., electricity, water) were generally either not available or much less precise, the gas realization rates were used for all savings.

The EC cost effectiveness methodology applied in 2021 is consistent with what has been done since 2015. This includes the cost of carbon, which was first included in 2017. One notable change has been made with how the cost of carbon is treated.

As part of the OEB's DSM Mid-Term Report, the OEB advised that carbon costs will be added to the cost-effectiveness test. Since the 2017/2018 DSM annual verification cycle, the EC was directed by the OEB to use the approach consistent with the 2019 Achievable Potential Study[116]. The Federal Fuel Charge Rate was applied to all rate classes and avoided cost load profiles. Additionally, there was only set carbon pricing until 2022. After 2022, a GDP FDD IPPI INDEX four month moving average inflation rate of 1.61% was used to calculate the estimated carbon price in remaining years.

[116] Navigant, 2019. Integrated Ontario Electricity and Natural Gas Achievable Potential Study.

In December 2020, a federal regulatory update[117] established annual carbon pricing increases of $15/tonne from 2023 to 2030. The difference is significant. To illustrate, using the previous approach for 2020 avoided costs, the price for carbon in 2023 would have been $50.81/tCO2e and $56.81/tCO2e in 2030. The updated federal prices are $65/tCO2e in 2023 and $170/tCO2e in 2030. Beyond 2030, a 2% inflation rate for remaining years (i.e., year 20 to 30) is applied. See Table 11-163 and Table 11-165 below.

While this deviates from the 2015-2020 Plan, the impact of applying the weightings to account for fully and partially exempt customers and volumes is material. The EC was directed to make this change by the OEB to accurately reflect the impact of carbon pricing in TRC calculations. This is reflected in EGI's proposed DSM Plans and reflects a similar approach to how avoided costs are updated annually to reflect the most current information available.

The 15% non-energy benefit (NEB) adder was applied to gas, electricity, and water avoided costs before adding carbon costs. The cost of carbon and NEB adder is applied to the TRC-Plus. The PAC test includes carbon and natural gas resources only (i.e., there are no electricity and water benefits), but it does not include the NEB adder. In tables later in this section, the EC has reported on what was provided by Enbridge and has not verified avoided figures.

In 2019, the EC began reporting program level cost effectiveness results with and without overhead & administration costs**.** A variety of costs are incurred by utilities to deliver programs, and how they are allocated at various levels (measure, program, sector, scorecard, and portfolio) can impact their perceived economic benefits. Consistent with previous years, the EC did not apply the utilities' portfolio overhead costs for research, evaluation, and administration. However, in past years, the EC has apportioned Enbridge's explicit 'overhead' spend at the scorecard level to individual programs based on the distribution of savings. In 2019, EAC members debated whether this was appropriate. The National Standards Practice Manual[118] provides guidance on how to properly allocate overhead & administrative (O&A) costs (see text box below), however some believe that all O&A costs should be fully accounted for at the program level, and it is not clear what the utilities include in the "overhead & admin costs" and what is truly variable and fixed. The OEB agreed to show program level cost effectiveness results with and without O&A costs. The O&A costs are still applied at the scorecard and portfolio levels.

Allocating Costs to Assess Cost Effectiveness

The National Standards Practice Manual (NSPM) for Benefit-Cost Analysis of Distributed Energy Resources recommends that only truly variable costs (i.e., costs that can be avoided) be included at the appropriate levels (e.g., measure, program, sector, portfolio) and costs that are largely fixed at a particular level be excluded. Including fixed costs at the wrong level may results in removal of programs that do not appear cost effective, reducing the economic benefits of efficiency resource acquisition. Fixed costs at one level should not, however, be excluded altogether and should be included at higher levels where they are variable and thus avoidable. The NSPM provides examples of the costs to include at various levels when assessing cost effectiveness and shown below:

- **Measure level**: Include only costs that increase or decrease in proportion to the number of measures installed. This includes the measure incremental cost and could include some variable program delivery costs such as rebate processing costs (e.g., vendor costs for every rebate processed).
- **Program level**: Costs of administering and evaluating the program should be included at the program level and, in some cases, where marketing is variable. Marketing is often treated as a fixed cost; it can play an important role in raising awareness and driving program participation, but costs do not typically change with participation.
- **Portfolio level**: Portfolio level costs that are largely fixed and do not change in proportion to the number of programs or participation levels (e.g., portfolio level marketing, management, and evaluation costs) should be included at portfolio level analysis.

[117] Update to the Pan-Canadian Approach to Carbon Pollution Pricing 2023-2030. Accessed at https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/carbon-pollution-pricing-federal-benchmark-information/federal-benchmark-2023-2030.html#toc3

[118] The National Efficiency Screening Project .2017. National Standards Practice Manual. Accessed at https://www.nationalenergyscreeningproject.org/the-national-standard-practice-manual-for-energy-efficiency/

11.15.2 Summary of Results[119]

Table 11-159 shows summary results for Enbridge TRC-Plus and PAC tests. Table 11-160 shows the same information for Union. The end of this section contains more tables with detailed results.[120]

All the utility-defined programs pass the OEB-defined cost effectiveness threshold of 0.7 for Low Income programs and 1.0 for all other programs using the TRC-Plus test.

Table 11-159. Enbridge summary of cost effectiveness ratio results*

Scorecard	Final Verified Ratio		Final Verified Net Present Value (M$)	
	TRC-Plus	PAC	TRC-Plus	PAC
Resource Acquisition	2.80	4.16	156.48	157.43
Low Income	1.65	2.74	14.71	20.72
Total	**2.56**	**3.89**	**171.19**	**178.15**

*Not all values may compute exactly due to rounding.

Table 11-160. Union summary of cost effectiveness ratio results*

Scorecard	Final Verified Ratio		Final Verified Net Present Value (M$)	
	TRC-Plus	PAC	TRC-Plus	PAC
Resource Acquisition	1.82	4.28	69.74	103.21
Large Volume	5.23	6.00	15.74	13.66
Low Income	1.66	1.53	8.24	6.29
Performance Based	6.60	5.49	0.85	0.75
Total	**1.93**	**3.68**	**94.56**	**123.91**

*Not all values may compute exactly due to rounding.

While federal carbon taxes changes have increased the cost effectiveness of most programs, several OEB-defined programs did not meet the OEB-defined TRC-Plus cost effectiveness threshold with and without overhead & administrative (O&A) costs. Ratios without O&A costs are shown in brackets:

- **Enbridge's Resource Acquisition Run-It-Right program** fell significantly short of 1.0 in the TRC-Plus and PAC tests with a cost effectiveness ratio of 0.21 (0.21) and 0.13 (0.13) respectively.
- **Enbridge's Energy Leaders program** fell short of 1.0 in the TRC-Plus and PAC tests with a cost effectiveness ratio of 0.85 (0.87) and 0.98 (1.01) respectively.
- **Union's Performance Based RunSmart and Low Income Indigenous programs had program costs, but no savings**, thus the cost-effectiveness ratio is 0.

[119] Cost effectiveness results for the 2021 programs do not reflect the significant gas price increases occurring in 2022.
[120] The cost-effectiveness results are based on 2021 carbon tax rates.

11.15.3 Cost Effectiveness Inputs

Avoided Costs

Table 11-161: Enbridge Gas Avoided Costs

Year	Residential/Commercial			
	Baseload ($/m³)		Weather Sensitive ($/m³)	
	Rate	NPV	Rate	NPV
1	0.148	0.148	0.160	0.160
2	0.178	0.316	0.197	0.346
3	0.160	0.458	0.190	0.515
4	0.152	0.585	0.182	0.668
5	0.185	0.731	0.216	0.838
6	0.187	0.870	0.219	1.002
7	0.186	1.001	0.219	1.155
8	0.203	1.135	0.236	1.312
9	0.211	1.266	0.245	1.464
10	0.220	1.395	0.255	1.614
11	0.240	1.529	0.276	1.767
12	0.253	1.661	0.290	1.918
13	0.261	1.790	0.298	2.065
14	0.282	1.921	0.320	2.213
15	0.286	2.046	0.324	2.355
16	0.275	2.159	0.314	2.485
17	0.299	2.275	0.339	2.617
18	0.332	2.397	0.372	2.753
19	0.337	2.513	0.378	2.884
20	0.340	2.624	0.382	3.008
21	0.342	2.729	0.386	3.127
22	0.328	2.824	0.372	3.235
23	0.336	2.916	0.381	3.339
24	0.366	3.010	0.412	3.445
25	0.398	3.107	0.445	3.553
26	0.413	3.201	0.461	3.658
27	0.429	3.293	0.478	3.761
28	0.445	3.384	0.495	3.862
29	0.462	3.472	0.513	3.960
30	0.480	3.559	0.532	4.056

Table 11-162: Enbridge Water and Electricity Avoided Costs

Year	Res/Com/Ind			
	Water ($/1000 litres)		Electricity ($/KWh)	
	Rate	NPV	Rate	NPV
1	0.994	0.994	0.151	0.151
2	1.014	1.950	0.154	0.296
3	1.034	2.869	0.157	0.435
4	1.055	3.753	0.160	0.569
5	1.076	4.603	0.163	0.698
6	1.098	5.420	0.167	0.822
7	1.120	6.206	0.170	0.941
8	1.142	6.962	0.173	1.056
9	1.165	7.688	0.177	1.166
10	1.188	8.387	0.180	1.272
11	1.212	9.058	0.184	1.374
12	1.236	9.704	0.188	1.472
13	1.261	10.325	0.191	1.566
14	1.286	10.922	0.195	1.657
15	1.312	11.496	0.199	1.744
16	1.338	12.048	0.203	1.828
17	1.365	12.579	0.207	1.908
18	1.392	13.090	0.211	1.985
19	1.420	13.580	0.215	2.060
20	1.448	14.052	0.220	2.131
21	1.477	14.506	0.224	2.200
22	1.507	14.942	0.229	2.267
23	1.537	15.362	0.233	2.330
24	1.568	15.765	0.238	2.391
25	1.599	16.153	0.243	2.450
26	1.631	16.526	0.247	2.507
27	1.664	16.885	0.252	2.561
28	1.697	17.229	0.257	2.613
29	1.731	17.561	0.263	2.664
30	1.766	17.880	0.268	2.712

Table 11-163: Enbridge Carbon Avoided Costs

Year	Res/Com/Ind ($/m³)	
	Rate	NPV
1	0.078	0.078
2	0.098	0.171
3	0.127	0.284
4	0.157	0.415
5	0.186	0.562
6	0.216	0.722
7	0.245	0.894
8	0.274	1.076
9	0.304	1.265
10	0.333	1.461
11	0.340	1.649
12	0.347	1.830
13	0.353	2.004
14	0.361	2.172
15	0.368	2.333
16	0.375	2.487
17	0.383	2.636
18	0.390	2.779
19	0.398	2.917
20	0.406	3.049
21	0.414	3.176
22	0.422	3.299
23	0.431	3.416
24	0.440	3.529
25	0.448	3.638
26	0.457	3.743
27	0.466	3.843
28	0.476	3.940
29	0.485	4.033
30	0.495	4.122

Table 11-164: Union Gas Avoided Costs

Year	Residential/Commercial			
	Baseload (m3)		Weather Sensitive (m3)	
	Rate	NPV	Rate	NPV
1	0.130	0.130	0.173	0.173
2	0.127	0.249	0.176	0.339
3	0.131	0.366	0.179	0.498
4	0.122	0.468	0.171	0.641
5	0.159	0.594	0.208	0.806
6	0.165	0.717	0.216	0.966
7	0.163	0.831	0.214	1.117
8	0.182	0.951	0.234	1.272
9	0.193	1.072	0.246	1.425
10	0.198	1.188	0.253	1.574
11	0.218	1.309	0.274	1.726
12	0.234	1.432	0.291	1.878
13	0.238	1.549	0.296	2.024
14	0.259	1.669	0.319	2.172
15	0.265	1.785	0.325	2.314
16	0.250	1.888	0.311	2.442
17	0.270	1.993	0.333	2.572
18	0.306	2.105	0.370	2.707
19	0.311	2.213	0.376	2.837
20	0.312	2.314	0.379	2.961
21	0.313	2.410	0.381	3.078
22	0.295	2.496	0.364	3.183
23	0.299	2.578	0.370	3.284
24	0.329	2.662	0.401	3.387
25	0.359	2.749	0.432	3.492
26	0.371	2.834	0.446	3.594
27	0.384	2.917	0.460	3.693
28	0.397	2.998	0.475	3.790
29	0.411	3.076	0.491	3.884
30	0.425	3.153	0.507	3.975

Table 11-165: Union Carbon Avoided Costs

Year	Res/Com/Ind	
	Baseload/Weather Sensitive	
	Rate	NPV
1	0.078	0.078
2	0.098	0.171
3	0.127	0.284
4	0.157	0.415
5	0.186	0.562
6	0.216	0.722
7	0.245	0.894
8	0.274	1.076
9	0.304	1.265
10	0.333	1.461
11	0.340	1.649
12	0.347	1.830
13	0.353	2.004
14	0.361	2.172
15	0.368	2.333
16	0.375	2.487
17	0.383	2.636
18	0.390	2.779
19	0.398	2.917
20	0.406	3.049
21	0.414	3.176
22	0.422	3.299
23	0.431	3.416
24	0.440	3.529
25	0.448	3.638
26	0.457	3.743
27	0.466	3.843
28	0.476	3.940
29	0.485	4.033
30	0.495	4.122

Table 11-166: Union Water Avoided Costs

Year	Res/Com/Ind	
	Water ($/1000 litres)	
	Rate	NPV
1	0.882	0.882
2	0.899	1.730
3	0.917	2.545
4	0.936	3.329
5	0.955	4.083
6	0.974	4.808
7	0.993	5.505
8	1.013	6.175
9	1.033	6.819
10	1.054	7.439
11	1.075	8.034
12	1.096	8.607
13	1.118	9.158
14	1.141	9.688
15	1.164	10.197
16	1.187	10.687
17	1.211	11.157
18	1.235	11.610
19	1.260	12.045
20	1.285	12.464
21	1.310	12.867
22	1.337	13.253
23	1.363	13.626
24	1.391	13.983
25	1.418	14.327
26	1.447	14.658
27	1.476	14.976
28	1.505	15.282
29	1.535	15.576
30	1.566	15.859

Table 11-167: Union Electricity Avoided Costs

Year	Res/Com/Ind	
	Electricity ($/KWh)	
	Rate	NPV
1	0.151	0.151
2	0.154	0.296
3	0.157	0.435
4	0.160	0.569
5	0.163	0.698
6	0.167	0.822
7	0.170	0.941
8	0.173	1.056
9	0.177	1.166
10	0.180	1.272
11	0.184	1.374
12	0.188	1.472
13	0.191	1.566
14	0.195	1.657
15	0.199	1.744
16	0.203	1.828
17	0.207	1.908
18	0.211	1.985
19	0.215	2.060
20	0.220	2.131
21	0.224	2.200
22	0.229	2.267
23	0.233	2.330
24	0.238	2.391
25	0.243	2.450
26	0.247	2.507
27	0.252	2.561
28	0.257	2.613
29	0.263	2.664
30	0.268	2.712

11.15.4 Results Tables[121,122]

Enbridge Results

Table 11-168: Enbridge overall PAC results*†

Program	PAC Benefits ($)	PAC Costs ($)	PAC Value ($)	PAC Ratio
Resource Acquisition	206,989,000	49,776,000	157,435,000	4.16
Low Income	32,603,000	11,887,000	20,716,000	2.74
Total	**239,592,000**	**61,662,000**	**178,151,000**	**3.89**

*Not all values may compute exactly due to rounding.
†All dollar values are rounded to the nearest thousand.

Table 11-169: Enbridge Residential PAC results*†

Program	Annual net savings (m3)	Program-level Incentives ($)	Program-level general admin costs ($)	Portfolio Budget ($)	PAC Benefits ($)	PAC Costs ($)	PAC Value ($)	PAC Ratio w/ O&A Costs	PAC Ratio w/o O&A Costs
Residential Adaptive Thermostat	3,566,000	1,785,000	882,000	159,000	16,715,000	2,667,000	14,049,000	6.27	7.23
Home Energy Conservation	8,135,000	28,308,000	2,597,000	606,000	58,496,000	30,905,000	27,591,000	1.89	1.98
Verified Final Results	**11,701,000**	**30,092,000**	**3,479,000**	**766,000**	**75,211,000**	**33,571,000**	**41,640,000**	**2.24**	—

*Not all values may compute exactly due to rounding.
†All dollar values are rounded to the nearest thousand.

[121] Cost-effectiveness results for the 2021 programs do not reflect the significant gas price increases occurring in 2022.
[122] The cost-effectiveness results use 2021 carbon tax rates that increase by $15 per year up to $170 per tCO2e in 2030. Beyond 2030, a 2% inflation rate is applied.

Table 11-170: Enbridge Commercial & Industrial PAC results*†

Program	Annual net savings (m3)	Program-level Incentives ($)	Program-level general admin costs ($)	Portfolio Budget ($)	PAC Benefits ($)	PAC Costs ($)	PAC Value ($)	PAC Ratio w/ O&A Costs	PAC Ratio w/o O&A Costs
Run it Right‡	45,000	281,000	190,000	1,000	62,000	471,000	-409,000	0.13	0.13
C&I Prescriptive	3,278,000	1,683,000	1,009,000	114,000	11,395,000	2,692,000	8,703,000	4.23	4.67
C&I Direct Install	2,502,000	2,812,000	309,000	95,000	9,761,000	3,121,000	6,640,000	3.13	3.36
C&I Custom	22,517,000	5,983,000	3,540,000	1,240,000	109,743,000	9,523,000	100,220,000	11.52	16.20
Comprehensive Energy Management	130,000	19,000	121,000	9,000	786,000	140,000	646,000	5.60	6.56
Energy Leaders	45,000	240,000	17,000	3,000	252,000	257,000	-5,000	0.98	1.01
Verified Final Results	**28,517,000**	**11,018,000**	**5,187,000**	**1,462,000**	**131,999,000**	**16,204,000**	**115,795,000**	**8.15**	—

*Not all values may compute exactly due to rounding.
†All dollar values are rounded to the nearest thousand.
‡Run it Right costs include costs attributable to both the Resource Acquisition and Market Transformation scorecards.

Table 11-171: Enbridge Low Income PAC results*†

Program	Annual net savings (m3)	Program-level Incentives ($)	Program-level general admin costs ($)	Portfolio Budget ($)	PAC Benefits ($)	PAC Costs ($)	PAC Value ($)	PAC Ratio w/ O&A Costs	PAC Ratio w/o O&A Costs
Multi-Residential	4,329,000	2,811,000	1,890,000	263,000	24,866,000	4,701,000	20,165,000	5.29	7.16
Home Winterproofing	1,207,000	4,091,000	3,095,000	79,000	7,737,000	7,186,000	551,000	1.08	1.13
Verified Final Results	**5,536,000**	**6,902,000**	**4,985,000**	**342,000**	**32,603,000**	**11,887,000**	**20,716,000**	**2.74**	—

*Not all values may compute exactly due to rounding.
†All dollar values are rounded to the nearest thousand.

Table 11-172: Enbridge overall TRC-Plus results*†

Program	Annual net savings (m3)	Measure Incremental Costs ($)	TRC Plus Benefits ($)	Program Costs ($)	Overhead ($) ‡	TRC Plus Costs ($)	TRC Plus Value ($)	TRC Plus Ratio w/ O&A costs
Resource Acquisition	40,218,000	78,449,000	243,593,000	3,725,000	4,941,000	87,114,000	156,479,000	2.80
Low Income	5,536,000	17,509,000	37,202,000	3,390,000	1,595,000	22,495,000	14,707,000	1.65
Total	**45,754,000**	**95,958,000**	**280,795,000**	**7,115,000**	**6,536,000**	**109,609,000**	**171,187,000**	**2.56**

*Not all values may compute exactly due to rounding.
†All dollar values are rounded to the nearest thousand.
‡Portfolio overhead costs for research, evaluation, and administration are not being applied at the program level. Consistent with what was done in 2015, the EC calculated costs as the sum of all OEB-defined program costs, including program admin and overhead costs and spread these costs across all programs based on their weighted savings contribution. Costs do not include market transformation or portfolio overhead costs, with the exception of Run it Right, which includes Market Transformation costs.

Table 11-173: Enbridge Residential TRC-Plus results*†

Program	Annual net savings (m3)	Measure Incremental Costs ($)	TRC Plus Benefits ($)	TRC Plus Costs (equipment) ($)	TRC Plus Value (equipment) ($)	TRC Plus Ratio (equipment)	Program Admin Costs ($)	TRC Plus Ratio w/ O&A costs	TRC Plus Ratio w/o O&A costs
Residential Adaptive Thermostat	3,566,000	6,963,000	24,876,000	6,963,000	17,912,000	3.57	882,000	3.17	3.32
Home Energy Conservation	8,135,000	39,733,000	70,267,000	39,733,000	30,534,000	1.77	2,597,000	1.66	1.71
Verified Final Results	**11,701,000**	**46,696,000**	**95,142,000**	**46,696,000**	**48,446,000**	**2.04**	**3,479,000**	**1.90**	—

*Not all values may compute exactly due to rounding.
†All dollar values are rounded to the nearest thousand.

Table 11-174: Enbridge Commercial/Industrial TRC-Plus results*†

Program	Annual net savings (m3)	Measure Incremental Costs ($)	TRC Plus Benefits ($)	TRC Plus Costs (equipment) ($)	TRC Plus Value (equipment) ($)	TRC Plus Ratio (equipment)	Program Admin Costs ($)	TRC Plus Ratio w/ O&A costs	TRC Plus Ratio w/o O&A costs
Run it Right‡	45,000	137,000	68,000	137,000	-69,000	0.49	190,000	0.21	0.21
C&I Prescriptive	3,278,000	4,708,000	13,280,000	4,708,000	8,573,000	2.82	1,009,000	2.32	2.43
C&I Direct Install	2,502,000	3,091,000	11,603,000	3,091,000	8,512,000	3.75	309,000	3.41	3.64
C&I Custom	22,517,000	23,432,000	122,377,000	23,432,000	98,945,000	5.22	3,540,000	4.54	5.05
Comprehensive Energy Management	130,000	86,000	853,000	86,000	767,000	9.92	121,000	4.12	4.57
Energy Leaders	45,000	299,000	270,000	299,000	-29,000	0.90	17,000	0.85	0.87
Verified Final Results	**28,517,000**	**31,752,000**	**148,451,000**	**31,752,000**	**116,698,000**	**4.68**	**5,187,000**	**4.02**	—

*Not all values may compute exactly due to rounding.
†All dollar values are rounded to the nearest thousand.
‡Run it Right costs include costs attributable to both the Resource Acquisition and Market Transformation scorecards.

Table 11-175: Enbridge Low Income TRC-Plus results*†

Program	Annual net savings (m3)	Measure Incremental Costs ($)	TRC Plus Benefits ($)	TRC Plus Costs (equipment) ($)	TRC Plus Value (equipment) ($)	TRC Plus Ratio (equipment)	Program Admin Costs ($)	TRC Plus Ratio w/ O&A costs	TRC Plus Ratio w/o O&A costs
Multi-Residential	4,329,000	14,499,000	27,757,000	14,499,000	13,258,000	1.91	1,890,000	1.69	1.83
Home Winterproofing	1,207,000	3,010,000	9,445,000	3,010,000	6,435,000	3.14	3,095,000	1.55	1.65
Verified Final Results	**5,536,000**	**17,509,000**	**37,202,000**	**17,509,000**	**19,693,000**	**2.12**	**4,985,000**	**1.65**	—

*Not all values may compute exactly due to rounding.
†All dollar values are rounded to the nearest thousand.

Union Results

Table 11-176: Union Resource Acquisition PAC results*

Program	Annual net savings (m3)	Program-level Incentives ($)	Program-level general admin costs ($)	Portfolio Budget ($)	PAC Benefits ($)	PAC Costs ($)	PAC Value ($)	PAC Ratio w/ O&A costs	PAC Ratio w/o O&A costs
Home Reno Rebate	3,694,000	10,221,000	2,544,000	760,000	26,330,000	12,765,000	13,565,000	2.06	2.28
Residential Thermostats	1,546,000	813,000	675,000	89,000	7,180,000	1,488,000	5,692,000	4.83	6.10
C&I Prescriptive	2,102,000	1,640,000	845,000	148,000	8,769,000	2,485,000	6,285,000	3.53	3.87
C&I Direct Install	1,363,000	1,838,000	194,000	121,000	5,570,000	2,032,000	3,538,000	2.74	2.93
Commercial & Institutional Custom	26,754,000	8,795,000	3,882,000	755,000	86,812,000	12,678,000	74,134,000	6.85	9.39
Verified Final Results	**35,458,000**	**23,308,000**	**8,140,000**	**1,872,000**	**134,662,000**	**31,448,000**	**103,214,000**	**4.28**	—

*Not all values may compute exactly due to rounding.

Table 11-177: Union Low Income PAC results*

Program	Annual net savings (m3)	Program-level Incentives ($)	Program-level general admin costs ($)	Portfolio Budget ($)	PAC Benefits ($)	PAC Costs ($)	PAC Value ($)	PAC Ratio w/ O&A costs	PAC Ratio w/o O&A costs
Furnace End-of-Life	0	0	0	0	0	0	0	—	—
Indigenous	0	2,000	70,000	4,000	0	71,000	-71,000	0.00	0.00
Home Weatherization	2,012,000	5,375,000	3,693,000	540,000	13,241,000	9,068,000	4,173,000	1.46	1.58
Multi Family	954,000	1,921,000	905,000	168,000	5,016,000	2,827,000	2,189,000	1.77	1.95
Verified Final Results	**2,966,000**	**7,298,000**	**4,668,000**	**712,000**	**18,257,000**	**11,966,000**	**6,290,000**	**1.53**	—

*Not all values may compute exactly due to rounding.

Table 11-178: Union Large Volume PAC results*

Program	Annual net savings (m3)	Program-level Incentives ($)	Program-level general admin costs ($)	Portfolio Budget ($)	PAC Benefits ($)	PAC Costs ($)	PAC Value ($)	PAC Ratio w/ O&A costs	PAC Ratio w/o O&A costs
Large Volume	9,712,000	2,250,000	479,000	162,000	16,386,000	2,729,000	13,657,000	6.00	7.03
Verified Final Results	**9,712,000**	**2,250,000**	**479,000**	**162,000**	**16,386,000**	**2,729,000**	**13,657,000**	**6.00**	—

*Not all values may compute exactly due to rounding.

Table 11-179: Union Performance Based PAC results*

Program	Annual net savings (m3)	Program-level Incentives ($)	Program-level general admin costs ($)	Portfolio Budget ($)	PAC Benefits ($)	PAC Costs ($)	PAC Value ($)	PAC Ratio w/ O&A costs	PAC Ratio w/o O&A costs
RunSmart	0	0	27,000	2,000	0	27,000	-27,000	0.00	0.00
Strategic Energy Management	970,000	15,000	124,000	8,000	913,000	139,000	774,000	6.57	10.57
Verified Final Results	**970,000**	**15,000**	**151,000**	**10,000**	**913,000**	**166,000**	**747,000**	**5.49**	—

*Not all values may compute exactly due to rounding.

Table 11-180: Union Resource Acquisition TRC-Plus results*

Program	Annual net savings (m3)	Measure Incremental Costs ($)	TRC Plus Benefits ($)	TRC Plus Costs (equipment) ($)	TRC Plus Value (equipment) ($)	TRC Plus Ratio (equipment)	Program Admin Costs ($)	TRC Plus Ratio w/ O&A costs	TRC Plus Ratio w/o O&A costs
Home Reno Rebate	3,694,000	19,995,000	30,487,000	19,995,000	10,492,000	1.52	2,544,000	1.35	1.43
Residential Thermostats	1,546,000	2,976,000	10,666,000	2,976,000	7,690,000	3.58	675,000	2.92	3.19
C&I Prescriptive	2,102,000	3,620,000	10,349,000	3,620,000	6,729,000	2.86	845,000	2.32	2.44
C&I Direct Install	1,363,000	2,205,000	6,577,000	2,205,000	4,372,000	2.98	194,000	2.74	2.90
Commercial & Institutional Custom	26,754,000	48,170,000	96,763,000	48,170,000	48,593,000	2.01	3,882,000	1.86	1.99
Verified Final Results	**35,458,000**	**76,966,000**	**154,842,000**	**76,966,000**	**77,876,000**	**2.01**	**8,140,000**	**1.82**	—

*Not all values may compute exactly due to rounding.

Table 11-181: Union Low Income TRC-Plus results*

Program	Annual net savings (m3)	Measure Incremental Costs ($)	TRC Plus Benefits ($)	TRC Plus Costs (equipment) ($)	TRC Plus Value (equipment) ($)	TRC Plus Ratio (equipment)	Program Admin Costs ($)	TRC Plus Ratio w/ O&A costs	TRC Plus Ratio w/o O&A costs
Furnace End-of-Life	0	0	0	0	0	—	0	—	—
Indigenous	0	0	0	0	0	—	70,000	0.00	0.00
Home Weatherization	2,012,000	4,797,000	15,580,000	4,797,000	10,782,000	3.25	3,693,000	1.83	1.99
Multi Family	954,000	3,069,000	5,196,000	3,069,000	2,127,000	1.69	905,000	1.31	1.40
Verified Final Results	**2,966,000**	**7,867,000**	**20,776,000**	**7,867,000**	**12,909,000**	**2.64**	**4,668,000**	**1.66**	—

*Not all values may compute exactly due to rounding.

Table 11-182: Union Large Volume TRC-Plus results*

Program	Annual net savings (m3)	Measure Incremental Costs ($)	TRC Plus Benefits ($)	TRC Plus Costs (equipment) ($)	TRC Plus Value (equipment) ($)	TRC Plus Ratio (equipment)	Program Admin Costs ($)	TRC Plus Ratio w/ O&A costs	TRC Plus Ratio w/o O&A costs
Large Volume	9,712,000	3,238,000	19,454,000	3,238,000	16,215,000	6.01	479,000	5.23	5.86
Verified Final Results	**9,712,000**	**3,238,000**	**19,454,000**	**3,238,000**	**16,215,000**	**6.01**	**479,000**	**5.23**	**-**

*Not all values may compute exactly due to rounding.

Table 11-183: Union Performance Based TRC-Plus results*

Program	Annual net savings (m3)	Measure Incremental Costs ($)	TRC Plus Benefits ($)	TRC Plus Costs (equipment) ($)	TRC Plus Value (equipment) ($)	TRC Plus Ratio (equipment)	Program Admin Costs ($)	TRC Plus Ratio w/ O&M costs	TRC Plus Ratio w/o O&M costs
Run Smart	0	0	0	0	0	—	27,000	0.00	0.00
Strategic Energy Management	970,000	0	1,000,000	0	1,000,000	—	124,000	8.06	13.99
Verified Final Results	**970,000**	**0**	**1,000,000**	**0**	**1,000,000**	**—**	**151,000**	**6.60**	—

*Not all values may compute exactly due to rounding.

About DNV

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ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance

Interrogatory

Reference:

Evaluation Advisory Committee. Exhibit A, Tab 3, Schedule 1, Page 2.

Question(s):

a) Please provide a copy of the Evaluation, Monitoring, and Verification (EM&V) plan prepared by the Evaluation Advisory Committee.

b) Please inform us if the EAC issued any report regarding the evaluation and audit of the DSM results.

c) If so, please provide a copy of the report issued by the EAC.

Response:

a) The Evaluation, Monitoring, and Verification (EM&V) plan prepared by the OEB's Evaluation Contractor is provided as Attachment 1.

b) - c)

The EAC did not issue any reports regarding the evaluation and audit of DSM results. However, the OEB's Evaluation Contractor, DNV, who is retained by the EAC, issued the 2021 Natural Gas Demand-Side Management Annual Verification Report, which is provided as Exhibit I.SBUA.1 Attachment 1.

DNV·GL

2021-2022 Natural Gas Demand Side Management Evaluation, Measurement, and Verification (EM&V) Plan

submitted to the Ontario Energy Board

Date: February 4, 2021

Table of Contents

1 INTRODUCTION

This document has been prepared for the Ontario Energy Board (OEB) and outlines the Evaluation, Measurement & Verification (EM&V) plan related to Enbridge Gas Distribution Inc.'s (Enbridge) and Union Gas Limited's (Union) natural gas demand-side management (DSM) programs delivered in 2020 and 2021. Although Enbridge and Union amalgamated effective January 1, 2019, becoming Enbridge Gas Inc., the programs continued to be delivered to the various service territories of the legacy utilities to align with previous OEB approvals. The outcome of the exercise is a list of prioritized evaluation activities to be completed in 2021. The OEB approved a 2021 DSM plan for Enbridge Gas Inc. in July 2020.

The overall objectives of the evaluations are to:

- Assess portfolio impacts for the purpose of determining 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.

To date, the Evaluation Contractor (EC) team has completed evaluations of the 2015 through 2019 program years. Targeted studies have been implemented on custom commercial and industrial (C&I) measure life, custom and prescriptive C&I gross savings verification, spillover, and free ridership.

2 SCOPE

This evaluation plan addresses the DSM programs delivered in 2020 and 2021. Evaluations of the programs offered in 2015 through 2019 have already been completed, as shown in Table 1. The evaluation types in the plan include:

- **Annual Verification:** The verification of scorecard metrics and calculation of cost effectiveness, shareholder incentive, and lost revenue. This activity also covers the annual update of the technical resource manual (TRM).
- **Targeted Verification:** The verification of specific programs or projects, such as custom C&I, prescriptive C&I, and residential home retrofit.
- **Targeted Net-to-Gross:** The measurement of the influence of the program on the customers' decision to install the energy efficiency measure or project, resulting in net savings. Net savings are the input into the cost effectiveness, shareholder incentive, and lost revenue calculations; free ridership and spillover are components of net-to-gross.
- **Market assessment and market transformation**: The study of market conditions to determine standard practice or market movement. This category includes the measure life study, multi-year market impact study, and new construction market transformation evaluation.

3 BACKGROUND

Evaluation activities conducted for the last four program years are shown in the table below.

Table 1. Evaluation activities completed for 2015 to 2019 program years

Evaluation Activity	Program Year				
	2015	2016	2017	2018	2019
Annual Verification (Annual Report, Cost Effectiveness, Technical Resource Manual)*	✓	✓	✓	✓	✓
Custom Commercial and Industrial Savings (Verification)	✓	✓	✓	✓	
Custom Commercial and Industrial Savings (Free Ridership)	✓			✓	
Custom Commercial and Industrial Savings (Spillover)	✓				
Custom Commercial and Industrial (Measure Life Study)		✓			
Prescriptive Commercial and Industrial Savings (Verification and Net-to-Gross)			✓		

*The annual verification includes tracking certification of the C&I Prescriptive programs and desk reviews of projects installed under the whole home programs.

4 METHODOLOGY

Evaluation activities are identified and selected using input from three primary sources:

- **Evaluation Contractor:** At the start of the current DSM Framework, the Evaluation Contractor applied a value of information decision process to identify and prioritize a menu of evaluation activities for the DSM portfolio, presented in high, medium, and low priority categories. Those priorities were released in the 2016-2018 Natural Gas Demand Side Management Evaluation, Measurement, and Verification (EM&V) Plan. Most high priority evaluation activities have been completed. As the 2020 DSM programs are substantially similar to the 2016-2019 programs, the 2016-2018 EM&V plan priorities remain suitable.
- **Evaluation Advisory Committee:** The Evaluation Advisory Committee (EAC) provides advice on the scope and timing of possible evaluation activities. The EAC consists of representatives from OEB staff, the utilities, non-utility stakeholders, independent experts, and governmental observers.
- **Ontario Energy Board:** As the procurement agency for evaluation activities, the Staff at the Ontario Energy Board (OEB) provide input on the annual budget available for evaluation activities and which studies can be implemented in a given year.

The recommendations contained in this report are for consideration by the OEB based on the EC's review of the programs and evaluation work to date. The decision to proceed on any evaluation must be made by the OEB. For example, though the EC recommends a residential home retrofit evaluation, the OEB would need to determine whether to proceed with the study based on numerous factors such as anticipated changes to the program, target market, and EAC advice.

5 SUMMARY OF PLAN

Table 2 shows a list of the EC recommended evaluation activities in 2021 and 2022, including the rationale for each activity and the status of the effort at the time this document was finalized.

Table 2. Summary of evaluation plan by type of evaluation

Evaluation Activity	Rationale / Opportunities	Priority	Status
Annual Verification for 2020 & 2021 program years	This work produces the OEB's annual evaluation report, which is used to verify overall utility performance.	High	Status quo; Evaluation Contractor contract already established.
Custom Commercial and Industrial Savings Verification of eTools	This work will focus on validating and increasing the accuracy of energy modeling software.	High	Study approved; analysis method being finalized
Custom Commercial and Industrial Savings Verification	Depending on COVID-19 status, re-assess to determine whether traditional verification, including on-site visits, is appropriate.	Medium	Recommended by EC to consider alternate approaches
Custom Commercial and Industrial Free Ridership Study	This work will focus on estimating free ridership for the 2020 and/or 2021 program years.	Medium	Recommended by EC
Residential Home Retrofit	This study may include verification of assumptions used in energy modelling software, billing analysis and/or the review of the manner in which the software is used. Analysis in these areas can help increase the accuracy of estimated savings, cost effectiveness and energy reductions in residential programs. OEB Staff is working with the EC and Evaluation Advisory Committee (EAC), including Enbridge, to understand what evaluation study would provide the most useful data to inform the program going forward, given the anticipated changes to program design.	High	Recommended by EC. A competitive proposal process is being considered. The approach and value are being discussed with the EAC.
Multi-Year Market Impact Study	This study would evaluate the overall influence that a long-standing program (or two) has had on the broader market. It will look at manufacturing, retail, and consumer trends, among others. It would provide valuable information for the new DSM policy framework and direction for future program design.	Low	OEB Staff is in preliminary research and discussions with the EC and EAC.
New Construction Market Transformation Evaluation	This study would evaluate the current new construction market transformation program to understand how building practices have shifted because of the program.	Low	OEB Staff is in preliminary research and discussions with the EC and EAC.

6 KEY EVALUATION DESIGN CONSIDERATIONS AND RECOMMENDATIONS

The recommendations in Table 2 are consistent with the evaluation activities that have been conducted throughout the 2015-2020 DSM Framework; however, recently the EC and EAC have been discussing alternative approaches that could be considered. These include:

- **Residential Home Retrofit Program:** The residential home retrofit program has been central to the utility portfolio and is allocated a sizable portion of the overall budget and shareholder incentive. Although efforts have been taken in the past to complete an evaluation of the residential home retrofit programs, no evaluation has transpired.

  EC RECOMMENDATION: The EC recommends that the residential home retrofit programs be studied. Considering key changes to the program, the nature and scope of the evaluation should be discussed further with the EAC to ensure the final scope and results will be useful. Evaluation options that should be considered include verification of assumptions used in energy modelling software, billing analysis, and/or the review of the manner in which the software is used. Studying these areas will help increase the accuracy of estimated savings, cost effectiveness and energy reductions in residential programs. If billing analysis is pursued, the EC recommends the 2018 residential home retrofit program provide the population for a billing analysis. By using the 2018 program, the evaluator will have a full year of billing data to analyze post measure installation.

  OEB RESPONSE: The OEB agrees that it is important to study the home retrofit program, but that further discussions with the EC and EAC are required in order to ensure the final scope and results will be useful.

- **Custom C&I Verification (CPSV):** The annual CPSV process has historically included an extensive evaluation effort to verify the savings achieved by custom DSM programs in C&I facilities. While the level of evaluation is warranted due to the portion of the gross cumulative portfolio savings represented by these programs (50% in 2018), consistent year-over-year verification results have demonstrated that a less rigorous process could be employed to provide similar value. The adjustment factors for CPSV, shown in Table 3, have historically stayed within a relatively small band close to 100%.

Table 3. Historical CPSV and free ridership adjustment factors for Enbridge and Union

Evaluation Activity	Program Year			
	2015	2016*	2017†	2018
CPSV Adjustment Factors				
Enbridge C&I	95%	105%	109%	111%
Union C&I	98%	101%	91%	91%
Union Large Volume	135%	101%	90%	90%
Free Ridership Adjustment Factors				
Enbridge C&I	31%	29%	50%	53%
Union C&I	44%	35%	37%	37%
Union Large Volume	12%	9%	15%	15%

* 2016 free ridership values are based on the 2015 NTG study results, adjusted for the mix of projects installed in the 2016 program.

† 2017 free ridership values are based on the 2018 NTG study, which was completed at the same time as the 2017 evaluation. The 2018 study results were adjusted for the mix of projects installed in the 2017 program.

Aside from a 135% adjustment on the 2015 Union Large Volume program, the adjustment factors resulting from CPSV studies have ranged between 90% and 111%. Over the past three evaluations and within individual programs, the range of adjustments is even smaller, with the Union Large Volume program showing the largest band at 11%, from 90% to 101%. These relatively consistent results suggest two possible adjustments to the existing annual study:

- The cadence of CPSV studies could be decreased from the current one study per year to one study per 1.5 years or one study per two years.
- The sampling methodology could be changed to implement "rolling" samples that reduce the number of projects reviewed each year. In this methodology, the samples are combined across years to get a statistically precise adjustment factor. For example, if the most recent verification sampled 100 sites in 2019, a rolling analysis could limit the 2020 sample to 60 sites and combine them with several sites from 2019 to produce a 2020 adjustment factor. The 2021 year would also include 60 sites and be combined with the 2020 sample to produce 2021 results. (The numbers used in the example are for illustration purposes only.) A rolling sample can be implemented across any defined time frame; it does not only need to be over two years. A shorter rolling time period could be more effective until the new DSM framework is in place. A longer rolling time period will require fewer sites per year to achieve the same precision. A similar process is used in Massachusetts, where a three-year rolling average is used to estimate gross savings.

Both options will produce results at a lower cost and effort for a calculation input that has not varied significantly across the previous four program years.

EC RECOMMENDATION: The EC recommends that future evaluations implement a multi-year rolling sample methodology to determine custom C&I gross savings. Because of the ongoing COVID-19 pandemic, it's difficult to know whether this methodology can be implemented with the 2020 program year evaluation, or whether the evaluation will be curtailed like 2019.

OEB RESPONSE: In an effort to use evaluation resources as effectively as possible, the OEB, with input from the EC and EAC, is considering alternative approaches to determine custom C&I gross savings, including reducing the frequency of site visits and conducting site assessments remotely.

- **Custom C&I Net-to-Gross (NTG):** The evaluation of free ridership is less expensive than CPSV and less time consuming, while having an important role in confirming net custom program savings. The free ridership adjustment factors, shown in Table 3, have historically been evaluated to fall around or below 50% and across a range of values from 9% to 53%. Even within programs, the range can be high, with the Enbridge C&I program ranging from 29% to 53%, a band of 24%. The larger range of adjustments suggest that free ridership studies could be conducted more frequently than the current cadence of one study every two years. With this change, the free ridership study could also be adjusted to a more real-time measurement scheme, with data collection undertaken as close to project installation as possible, which improves the quality of the final result.

  EC RECOMMENDATION: The EC recommends annual free ridership measurement with data collection conducted in two rounds, starting in the 2020 program year. Annual measurement will increase the accuracy of the net savings used in the shareholder incentive and lost revenue calculations. Two rounds of data collection will ensure that data is collected closer to the time of project implementation, which is a best practice in free ridership studies.

  OEB RESPONSE: The OEB will consider more frequent free ridership assessments in order to prioritize evaluation resources to areas that will help ensure final verified savings are as accurate as possible.

About DNV GL

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ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance

Interrogatory

Reference:

Custom Commercial Offering. Exhibit A, Tab 4, Schedule 1, Page 40.

Question(s):

a) What technical assistance was offered to small commercial customers to address their specific needs in connection with the Custom Commercial Offering?

b) What financial incentives were offered to small commercial customers specifically?

Response:

a) Within both the EGD and Union Rate Zones' Commercial Custom offerings, Enbridge Gas provides technical assistance to commercial customers, including small commercial customers, as follows:

- Facility walk-through and opportunity evaluation
- Energy Team meeting participation
- Pre-feasibility assessment of energy efficiency projects
- Training of internal technical personnel
- Energy savings estimates and calculations
- Webinars/Workshops to business partners and/or customers

As part of its Commercial Custom offerings, Enbridge Gas works with individual customers to determine which services can help meet individual customer needs. This support can also include identifying opportunities across Enbridge Gas's suite of other offerings for which the individual small commercial customer could be eligible.

b) Small commercial customers are most likely to make use of incentives offered through Enbridge Gas's Commercial Custom, Prescriptive, and Direct Install offerings. However, depending on the nature of the small commercial customer and its needs, it may be eligible for a variety of financial incentives across the suite of Enbridge Gas's Resource Acquisition, Low-Income, and Market Transformation

program offerings. Incentives offered for all program offerings are provided in EB-2023-0062, Exhibit A, Tab 4, Schedule 1 Appendix C (EGD Rate Zone) and Appendix D (Union Rate Zones).

ENBRIDGE GAS INC.

Answer to Interrogatory from
Small Business Utility Alliance

Interrogatory

Reference:

Commercial & Industrial Direct Install Offering. Exhibit A, Tab 4, Schedule 1, Page 45.

Preamble:

EGI states that "converting quotes into sales was a continuing challenge given COVID-19 impacts to small business customers", regarding the Commercial/Industrial Direct Install Offering.

Question(s):

a) How did EGI market the two measures, Air Curtains and Dock Door Seals, to small businesses customers? Specifically, how the question of installation costs was communicated to customers.

b) Please discuss further how Enbridge Gas Inc. attacked the lack of "awareness of efficient ventilation technology".

c) Please discuss further if the bonus offered in 2020 in response to COVID-19 was useful or not.

d) Please discuss what are the identified barriers mentioned in the *"Anticipated Offering Changes for 2022".*

Response:

a) The Enbridge Gas Commercial & Industrial Direct Install offering is marketed as a turnkey solution, targeting smaller customers who are less likely to participate in traditional offerings, by providing installation of energy efficient technologies. Enbridge Gas deployed a variety of tactics to attract small business owners, such as Enbridge Gas branded communications (email, direct mail), and phone calls from Enbridge Gas delivery partners. The offer was described in the marketing material as the Shipping Door Installation Program and communications outlined that customers only have to pay 10-15% of the total cost to install.

b) As outlined in the 2021 Annual Report, “Specific to the DCKV offer, Enbridge Gas found that customer awareness of efficient ventilation technology remains low and there continues to be limited understanding of how commercial kitchen ventilation could be updated to save energy. Enbridge Gas continued to develop customer case studies to provide examples; explaining how the technology works, expected savings, the ease of installation and participation in the offer, as well as the ongoing energy savings that former participants experience.”[1]

   Enbridge Gas branded direct mail and email communications were sent to small business customers on a regular basis to make them aware of the technology and the turnkey offer that was available to them. Enbridge Gas Delivery Agents also educated small business customers during site assessments; explaining how the technology works to save energy and provided site specific advice regarding ventilation and energy efficiency in their commercial kitchens.

c) The incentive implemented in 2020 and extended into 2021 was useful for continuing to support small business customers as the impacts of the COVID-19 pandemic were expected to continue. As noted in the 2021 Annual Report, “Getting financial commitment continued to be a challenge given customers’ hesitancy to spend capital budget in times of uncertainty.”[2] Enbridge Gas believes that providing a bonus in addition to a turnkey solution during the pandemic was useful to ensure small businesses prioritize energy conservation.

d) At the end of 2021 it was becoming evident that the impacts of COVID would have lasting effects. As noted in the 2021 Annual Report, Enbridge Gas anticipated that it was necessary to develop “communications to overcome newly identified barriers”[3] in order to engage small businesses and have uptake through marketing activities. Anticipated barriers for 2022 included continued financial constraints reducing availability of capital for small business to implement unplanned upgrades, staffing reductions limiting the time and attention of decision makers for energy conservation, and supply chain constraints impacting Enbridge Gas’ Delivery Agents timelines.

[1] Exhibit A, Tab 4, Schedule 1, p. 65.
[2] Exhibit A, Tab 4, Schedule 1, p.45.
[3] Exhibit A, Tab 4, Schedule 1, p.46.

ENBRIDGE GAS INC.

Answer to Interrogatory from
School Energy Coalition (SEC)

Interrogatory

Reference:

[Ex. A/3/1, p. 4, fn.13] The Verification Report referred to in the footnote says the following, at p. 3 of that Report:

"At the time this report was published, the EC was continuing to study and compare the savings estimates from Enbridge Gas Inc.'s digital tool (eTools) with those estimated by modelling site-level energy usage from customer bills.15 As this study was ongoing, we did not provide any conclusions from that investigation in this report."

Question(s):

a) Please file the final version of the referenced study of e-Tools.

b) Please recalculate the cumulative cubic meters saved as claimed, but assuming that all recommendations of the e-Tools study had been implemented prior to the beginning of 2021. Please provide details of the recalculation.

c) Please recalculate the shareholder incentives for 2021 on the assumption that the CCM claimed were those recalculated numbers applying the recommendations of the e-Tools study. Please provide the revised scorecard results and full details of the recalculation.

Response:

a) The final version of the eTools study is provided at Attachment 1.

b) - c)

Attachment 2 contains the claimed 2021 cumulative cubic meter savings recalculated with the eTools study adjustment factor applied. The attachment also includes the resulting recalculation of scorecard achievement and shareholder incentive.

Across all rate zones, application of the eTools study adjustment factor decreased 2021 claimed net cumulative gas savings by 30,414,591 m^3 or 2%. The shareholder incentive decreased by $282,390 or 4.4%.

Note that these values have not been verified by the Evaluation Contractor and there are outstanding questions about the application of these values that are expected to be confirmed in the 2022 audit. Enbridge Gas has provided them to be responsive.

DNV

ETOOLS BOILER TOOL VALIDATION STUDY

Ontario Energy Board

January 31, 2023

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1 EXECUTIVE SUMMARY

This report discusses the analysis completed during the study of Enbridge Gas Inc.'s (EGI) eTools energy modelling software. EGI has used eTools to estimate natural gas savings for many years. EGI uses eTools to estimate gas savings from the installation of energy-efficient boiler equipment offered through EGI's Custom Commercial Program and Affordable Multi-Family Housing Program. These programs, approved by the Ontario Energy Board (OEB) as part of EGI's broader natural gas demand side management (DSM) portfolio, offer customers incentives and guidance related to specific retrofits at their buildings which typically include efficiency upgrades to the boilers. Historically, commercial and multi-residential projects containing boiler system interventions have represented approximately 25% of annual custom program savings.

Gas consumption savings in eTools are estimated (ex ante) utilizing pre-period gas consumption and detailed engineering assumptions. The OEB has accepted these estimates as part of its evaluation process and subsequently, to calculate performance incentives and lost revenues.

The findings of this study will be used to provide guidance to the OEB on whether eTools can be relied on to estimate savings for projects completed through EGI's approved DSM programs and relied on by the OEB for use as part of future evaluation activities and ultimately as part of final verified natural gas savings results that are used to assess EGI's performance relative to OEB-approved metrics.

This study included two phases of analysis.

- Phase 1 used billing analysis to estimate natural gas savings (referred to as evaluated savings) by utilizing gas consumption of a facility before and after the installation of the efficiency measure, in this case, a boiler. This was compared to the estimate produced by EGI's eTools model. The Phase 1 analysis found that billing analysis savings were 64% to 68% of eTools estimates of savings. The realization rate figures for Phase 1 were preliminary results only with many known limitations that affected the analysis.
- Below is a description of how eTools estimates savings compared to the billing analysis conducted by DNV as part of this study:
  - eTools: Produces a forecast of gas savings from boiler system interventions using a calibrated engineering model that incorporates the usage at the site prior to the boiler system intervention, as well as anticipated configurations and settings for the new boiler systems. eTools makes several assumptions about the existing boiler system configuration, condition, use, and interaction with other systems in the facility. eTools also assumes that the new boiler will operate as intended, with no changes to settings after system commissioning.
  - Billing analysis: Uses actual natural gas consumption pre-intervention and post-intervention, it assumes that all observed changes in heating load at the site are due to the intervention, e.g., boiler system changes.
  - While neither method is perfect, billing analysis provides an empirical estimate of savings because it can leverage measured site usage from after the boiler system intervention.
- Phase 2 addressed several limitations in the Phase 1 analysis, including:
  - Using a consistent modern version of eTools for all sites and focusing on eTools savings estimates of advancement savings (existing consumption vs. efficient consumption) for an apples-to-apples comparison with billing analysis. The finding was that advancement savings estimated by the most recent version (e8-00) of eTools available during this study are 55% of the billing analysis estimates. However, advancement savings are not frequently used as reported program savings. Of the initial 456 projects for which Enbridge provided data to DNV only 85 projects (19%) utilized advancement savings for program savings and for these projects the advancement savings were only used for the remaining useful life of the existing equipment, not all of the lifetime savings. The balance of lifetime savings for advancement projects and non-advancement projects (81%) used standard savings (a counterfactual

industry standard system's consumption vs. efficient consumption) which are lower in magnitude than advancement savings, which is why the RR decreased from 64% in Phase 1 to 55% in this step of Phase 2.

- Explaining the differences in savings through simulating changes in assumptions in eTools that might produce estimates of savings more in line with billing analysis estimates. This investigation found that changing eTools' default assumption for existing boiler efficiency (73%) to values closer to market standard efficiencies (80.1% for space heating and 81.8% for domestic hot-water heating systems) and being more conservative with inputs to the efficient system control settings, increased the realization rate from 55% to 79%.
- Incorporating the findings from EGI's study of non-participant natural gas consumption trends (details in Section 3.11, the full study in APPENDIX A) into the billing analysis results increases the overall realization rate from 79% to 84%. The latter value is the one recommended for use in adjusting aggregate gross savings for commercial boiler projects that utilized eTools.
- Accounting for the possible double counting of changes to eTools boiler gross savings in this study and those in evaluation findings in the annual Custom Project Savings Verification (CPSV). The potential for double counting stems from adjustments to the system characteristics and control settings on the existing or efficient boilers during evaluations which are also captured in the billing data used in billing analysis. During the investigation, all eTools boiler projects (a total of 41) from previous evaluations were reviewed to identify the potential sources of double counting. The findings were that most changes to system characteristics and control settings from previous evaluations increased gross savings, and removing these adjustments decreased the aggregate eTools boiler gross savings realization rates from 102% (+/- 5%) to 97% (+/- 4%). Overall, the gross savings realization rates for previous evaluations with or without inclusion of adjustments potentially double counted are not statistically different from 100%.

Results of this study show that the savings from past and present eTools versions do not align with more empirical results from billing analysis. However, after key engineering assumptions are refined, eTools can provide an estimate of aggregate savings closer to those from billing analysis. Based on the analysis conducted in this study, the following recommendations are provided for the OEB's consideration:

1. Continue using eTools for implementation and evaluation. eTools is a sophisticated engineering-based estimation calculator that exceeds industry standard practice and generates local knowledge of implementation practices. There are no other boiler savings estimation models that are known to be more accurate, nor any known to be in development. Changing tools for evaluation will introduce additional uncertainty as to the causes of differences in verified vs. claimed savings. The continued use of this modelling software is akin to other simulation software which contain known performance gaps across all kinds in jurisdictions around the world. Despite these performance gaps, no jurisdiction has discarded their performance simulation software. EnergyPlus, 3E Plus, Integrated Engineering Software, etc. are all used to provide forecasted savings in buildings despite rarely being accurate for an individual building. DNV recommends the following changes to eTools to address the study's findings and provide a more accurate estimate of savings:

    a. eTools advancement projects should not utilize the current 73% thermal efficiency default value, rather site-specific values (supported by documentation) should be utilized. If documented site-specific values are available, the efficiency values identified in this study, 80.1% for space heating and 81.8% for domestic hot-water heating, should be utilized by implementers and evaluators.
    b. Site-specific documentation verifying any anticipated controls or setpoint changes should be gathered by Enbridge after boiler system commissioning. If documentation verifying controls changes are unavailable, then the installed systems should be assumed to utilize the same controls and setpoints as the existing systems.

c. Version e8-00 of eTools was the latest version reviewed during this study and should be utilized by the evaluation team to assess any projects using eTools e8-00 or earlier.
d. Projects using a version of eTools more modern than e8-00 should use the modern version of eTools in evaluation. A "between version" calibration factor that takes the savings from version e8-00 relative to the new version should be employed to ensure that the changes from one version to another are accounted for without restricting the evaluation to using only version e8-00 prior to re-calibrating the billing analysis (see below in point 5). This calibration can be calculated using the sample plus the backup sample of projects in the evaluation (those that the evaluation requests files for as part of the typical evaluation process).

2. Future evaluations of eTools commercial boiler projects should continue in a manner consistent with Custom Project Savings Verification (CPSV) evaluations from 2015-2018 while updating the model to eTools version e8-00 or more modern. This means updating inputs to eTools based on site-specific data collected through evaluation activities.
3. After implementation of list items 1.a. and 1.b., the recommended realization rate from this study (84%), can be applied to evaluate aggregate eTools boiler gross savings. This recommended realization rate uses that described in 1a) above as well as incorporates the findings from EGI's study of non-participant natural gas consumption trends (APPENDIX A), explained in Section 3.11.
4. A correction factor for the double counting between evaluated gross savings and billing analysis should be utilized. As part of this study, it was found that based on past projects, the adjustment factor was 0.97. An alternative to using this factor is to re-estimate the correction factor based on the sample of projects evaluated in CPSV to apply to that year's CPSV results. The determination of which to use will be made by the evaluation team with input from the EAC and OEB. The primary factor in the decision will be the sample size of boilers evaluated.
5. eTools should be periodically calibrated via billing analysis to improve the accuracy of aggregate savings estimates. The precise cadence/timing of the calibration cannot be defined at this time in part because evaluation budget consideration necessarily have a role in determining the timing. Re-calibrating the billing analysis will be more about changes in use of eTools (defaults, assumptions and data entry choices) and less about the changes in the underlying calculations, which will be captured in the suggested "between version" calibration factor in 1d.
   The OEB and EAC should consider the following key factors when determining whether a billing analysis calibration should be conducted:

   a. Whether EGI's internal user guidelines for eTools have changed in a manner that materially impacts savings estimates produced. As informed by Enbridge's analysis of the impact of its user guideline changes to eTools. Materially in this case would be a change that is expected to change boiler savings by more than 5% in aggregate for boilers in the program. Note that 5% is a starting point to inform the EAC when it is time to start planning the next study.
   b. If newer eTools versions are found to produce savings materially different from the versions evaluated in this study As informed by Enbridge's analysis of the impact of its updates to eTools and/or the calibration factors estimated in 1d above. If calibration factors in 1d exceed 10% it is of higher priority to conduct another calibration. 10% is a starting point, given that 1d is likely based on a relatively small sample, it is prudent to use a higher threshold than 5a.
   c. If there is sufficient post-case heating data (minimum of two heating seasons) for the population of sites to be included in the billing analysis

Results from the two phases are reported separately in this report.

2 PHASE 1 OBJECTIVES AND APPROACH

2.1 Phase 1 Summary

Billing analysis is an industry-accepted empirical method of estimating ex post savings by utilizing gas consumption of a facility before and after the installation of the efficiency measure, in this case, a boiler. When the two methods (ex ante vs. ex post) are compared, the ratio of the ex post billing analysis results (evaluated results) to the ex ante results (e-Tools results) is called a realization rate (RR). Essentially, the RR represents the percentage of forecast efficiency savings that were found to be present when usage was measured through customer billing data. The purpose of Phase 1 was to produce RRs that provide insight into the accuracy of eTools as a basis for further investigation, not to produce a fully representative realization rate.

There are several ways to calculate the RR. In this analysis, DNV used three accepted methods, which showed RR results of 68%, 66%, and 64%. This means that the evaluated results were 64% to 68% of the eTools results. If described instead as an overestimation percentage, the three methods showed that eTools results were 47% to 56% higher than the evaluated results measured using a before and after billing analysis.[1] Table 2-1 the ratio-estimator RR (in the far-right column) is a ratio of the sum of savings for each approach. The other two RRs in the table (left columns) are calculated from regression lines through scatter plots of the two approaches (Figure 2-5 and Figure 2-6) based on savings, or savings as a percent of consumption. The three methods for determining RR weight customer facilities differently, but overall, provide consistent evidence that eTools savings are statistically greater than those found from the billing analysis conducted in Phase 1. This difference needs to be investigated further.

These RRs are conservative values because the billing analysis savings (in the numerator) are all advancement savings[2] (baseline is existing efficiency), whereas some eTools savings (in the denominator) are replacement savings utilizing a standard efficiency baseline greater than the existing efficiency, which decreases the denominator. If the two approaches were perfectly aligned, the resulting RR would be greater than one (>100%) making the difference in savings larger than indicated by these results.[3]

Table 2-1. Realization rates regression vs. quotient of sums

Population	Regression Trend RR		Ratio-Estimator RR
	Savings	% of Consumption	
Full analysis population	66%	64%	68%

The billing analysis method offers empirical results to compare against eTools' engineering estimate method. The billing analysis is a comparison of weather-normalized pre- and post-installation consumption that offers an estimate of advancement savings based on the consumption that occurred at the site. The primary risk to the billing analysis approach is the presence of non-routine events (NREs) that could undermine the assumption of steady-state pre- and post-installation operations separate from the energy efficiency measure's (EEM) implementation. NREs may cause significant changes (either positive or negative) in energy usage. Their impacts can also be small and impossible to identify within the distribution of energy savings estimates, but the presence of many NREs can bias billing analysis results in either direction.

[1] RR values have changed from those noted in the Phase 1 Study filed in EB-2021-0002, Undertaking J3.7 due to a change in the project start date field used in DNV's analysis. The Phase 1 Study reported values of 70%, 62%, and 64%, respectively. Details concerning this change are noted in Section 2.3.

[2] Advancement savings is the OEB term for savings calculated relative to existing efficiency at the site prior to measure installation. Replacement savings is the OEB term for savings calculated relative to the standard efficiency measure that would have been installed in the absence of the program measure.

[3] Even if all sites with negative savings are removed from the analysis, an action that ignores the natural variability of billing analysis results and injects upward bias into the results, these results stay well below one at 73%, 83%, and 91% respectively. These results should also be compared to an expected RR greater than one.

While addressing NREs directly is considered best practice in pre-post billing analysis, it is difficult to do so in a way that does not risk exchanging one source of potential bias for another.

A primary objective of this analysis was to explore if any potential sources of bias existed in eTools savings estimates. The analysis, in this first phase, was not designed to provide an exhaustive, fully-representative, RR. Rather, if the preliminary billing analysis results indicated either over or under-estimated savings, the site-level savings estimates could be used to explore potential sources of bias within the eTools calculator. In this preliminary stage, no attempt to address NREs was made. This means the resulting RR assumes NREs across the entire study population do not bias the result. Similarly, this result also assumes there are no underlying general trends, impacting natural gas usage, across time. That said, qualitative considerations were made as to the possibility that NRE-related bias could explain the preliminary RRs. Some considerations include:

- The billing analysis assumption that all resulting savings are from an advancement baseline could be a source of upward bias.
- eTools and the billing analysis both utilize outdated weather normals that substantially overestimate heating degree days (relative to current standard practice and expected future temperatures) producing an upward bias to both eTools savings and the billing analysis savings.

The analysis explored some potential drivers of low savings realization, such as intervention type, eTools version, audit sector, and pre-intervention consumption, but no obvious relationships were identified. The RR figures in this Phase 1 are preliminary results only. There are many known limitations, discussed in the memo body, to the comparison as it was done in Phase 1 that could make the actual performance of the e-Tools model better or worse than the preliminary numbers. Phase 2 is intended to address the identified limitations from Phase 1.

2.2 Phase 1 objectives and approach

The objectives of Phase 1 of the project were to:

- Estimate a RR for advancement period savings (existing equipment baseline) using a PRISM-based billing analysis for boilers installed through the EGI custom commercial, industrial, and multi-residential (including low-income) programs.
- Provide next steps to explore correlations between eTools project attributes and the alignment of eTools and billing analysis savings.
- Establish and maintain transparency throughout the project.
- Follow industry best practices.

The analysis approach included the 4 stages of data cleaning, weather-normalized savings calculation, site selection, and comparison of calculated savings with eTools modelled savings. Table 2-2 provides a summary of differences between the billing analysis and eTools approaches that could impact results.

Table 2-2. Summary of differences across billing analysis and eTools approaches

Area	Billing analysis	eTools	Comments
Data sufficiency	Two years pre- & post-implementation, actual reads only, minimum number of data points overall & in heating season	One year pre-implementation data, uses actual & estimated reads, selected from several years of consumption data based on good coefficient of determination	Best practice: Limiting to actual reads, 12 data points, and sufficient seasonal data to support heating trend.

Area	Billing analysis	eTools	Comments
Weather-normalizing regressions	Variable degree-day, separate for pre- & post-implementation	Fixed degree-day base	Variable degree-day offers the greatest flexibility to optimize data
Weather data	Calculate heating degree days (HDD) for specific days in each actual data bill period	HDD based on daily weather data	HDD for specific consumption days is essential to establish correlation
Weather normals	Required daily normals for variable DD modelling, so used actual weather year in last 10 with closest HDD to normals (had to be the coldest year to match the normal used by eTools)	Weather normals from 1970-2000 or 1980-2010 from Environment Canada.	Minimal effect on results. Also compared results based on fixed DD models using consistent normal. Historic weather normal are not representative of expected temperatures during EEM expected useful lives
Baseline efficiency in savings estimate	Existing efficiency (advancement savings)	Mix of existing & standard code (advancement & replacement savings)	Billing analysis results would be greater than eTools, all else being equal.
NREs	Not addressed. For this analysis, assumed not to bias result.	Could be present in pre-implementation data used to calibrate engineering estimate	NREs may explain some portion of the difference between evaluated savings & eTools savings but are extremely unlikely to explain most of the difference.

2.3 Data cleaning

Billing consumption data were first “rolled-up” to non-estimated reads. That is, estimated reads were combined with subsequent reads until an accurate reading for the combined billing period is confirmed with an “actual” read. For example, many sites offer monthly consumption reads but every other month had an estimated, not actual, value. The modelling process for the validation should reflect only “actual” reads rather than including reads that are themselves estimates from the utility with respect to when consumption took place. To have enough data for a robust model, the analysis included two full calendar years of pre- and post-installation data requiring a minimum number of data points as well as a minimum amount of data coverage during those two years. At the time of assessment, the eTools weather normalization procedure appears to use 12 months of data that are often a mix of actual and estimated billing data. Weather normalizing with too little actual data is a greater risk to the analysis than the possibility of including additional NREs by expanding windows to two full calendar years.

In the data cleaning step, DNV also established periods for calculating pre-intervention and post-intervention savings. For the original Phase 1 memo, data dated close to the project date variable in eTools–three months before the date and the next three to six months afterward[4]—were removed to account for lags in data entry or adjustments to the new equipment. Then the two years prior to this “exclusion period” were defined as the pre-intervention analysis period and the two years afterward as the post-intervention analysis period.

[4] If the project date occurred in spring, a longer exclusion date was created to ensure that the post period contained two full heating seasons.

EGI later indicated that the eTools files themselves had a more accurate way to estimate when the boiler was installed than simply relying on the tracking data field that was used as part of the initial Phase 1 analysis. Initial reporting used the "project date" variable from the tracking data. In response to the new information provided by EGI, DNV updated its analysis, relying on installation information fields from the eTools project files directly to help improve the accuracy of boiler installation dates. The preferred field for installation year is the "replacement year" variables for each space heating and water heating boilers. As these fields do not contain values for all of the sites in the sample, when "replacement year" values are absent, the year of "project closing date" is used instead; when the year of the "project closing date" is also absent, the year of the "project date" field is used. Once the year of installation was determined, the exclusion period was defined as the entire potential heating period in the installation year, August through the following April. Consumption during the exclusion period is excluded from the dataset used in analysis.

This shift in project dates and derived exclusion periods affected which sites met DNV's criteria for data sufficiency. This change from the initial Phase 1 analysis is discussed in Section 2.6.

2.4 Weather-Normalized savings calculation

For each premise in the analysis, DNV fit a premise-specific degree-day regression model separately for the pre and post periods, modelling the heating energy consumption for each billing period as a function of the total number of heating degree days during that period, as shown below:

$$E_m = \mu + \beta_H H_m + \varepsilon_m$$

where:

E_m	=	Average consumption per day during interval *m*;
H_m	=	Specifically, $H_m(\tau_H)$, average daily heating degree-days at the base temperature(τ_H) during meter read interval m, based on daily average temperatures over those dates;
μ	=	Average daily baseload consumption estimated by the regression;
β_H	=	Heating coefficient estimated by the regression;
ε_m	=	Regression residual

To produce a model specific to the energy consumption dynamics of each site, a variable degree-day model was fit. This variable degree-day approach entails the following:

1. estimating each site-level regression and period for a range of heating degree-day bases
2. choosing an optimal model (with the best fit, as measured by the coefficient of determination R^2) from among all models.

With degree-days allowed to vary, the estimated heating degree-day base τ_H approximates the highest average daily outdoor temperature at which the heating system is needed. These base temperatures reflect both average thermostat setpoint and building dynamics such as insulation, internal, and solar heat gains.[5] The base temperatures for most sites

[5] The analysis allowed different optimal degree-day bases for pre- and post- periods. This is standard best practice. DNV also performed the analysis using the fixed degree day base consistent with eTools. The flexible degree-day base does not cause substantially different results but does produce slightly higher estimates of savings than the fixed degree day base.

shifted between pre and post periods, with an average decrease of approximately 2% in the base temperature used. There was no statistically significant aggregate trend associated with a shift in degree day basis and the difference between savings reported by eTools and those found by DNV's analysis. The sites with higher base temperatures used for post intervention analysis had lower savings reported by eTools at approximately the same proportional level as those found in DNV's evaluation.

For this model, DNV also decided to weight consumption data points differently in the model based on the number of days included in the billing period. Periods with very few days were given low weights because they are more likely to be noisy because of day-to-day anomalies. Data points that included many months of data were also down weighted, as they were more likely to include both days with and without heating, and so may not represent the assumed linear relationship of heating and gas usage. Data points with greater than 65 days of data were down weighted using the function:

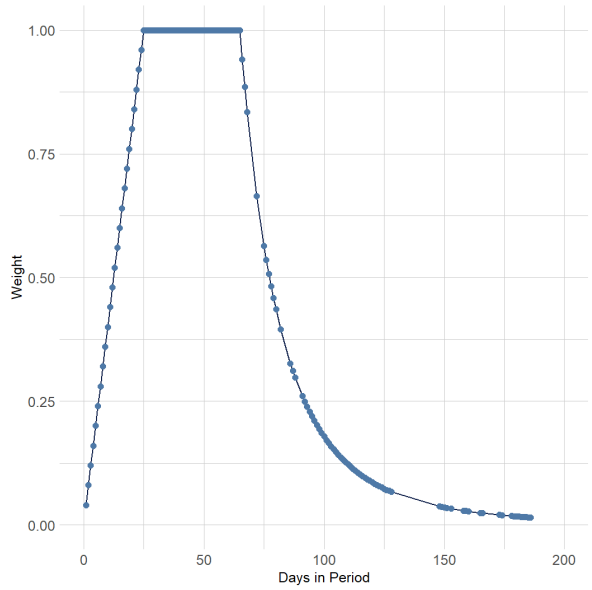
$$Weight = 65 - \left(\frac{65}{Number\ of\ Days}\right)^4$$

Datapoints with fewer than 25 days (Figure 2-1) were down weighted using the following function:

$$Weight = \frac{Numer\ of\ Days}{25}$$

This weighting schema was applied to data points representing different period lengths in the billing analysis model. This recognizes that a read with 5 days of data should not have the same weights as one with 30.[6] Points shown in Figure 2-1 represent data points in the model, but many points may be in the same spot. Most points fall in the weight =1 category. Fifteen points representing periods longer than 200 days are excluded.

Figure 2-1. Visual of weighting schema



[6] It is not uncommon to weight using count of days to account for the different amount of daily data in different length periods, especially when billing periods on are consistent monthly cycles. This analysis diverges from that here primarily due to the inclusion of longer read periods present in the billing data, which have less information to support heating trends. These periods are down-weighted rather than letting them get extra weight.

For each period, pre and post, DNV combined the coefficients of the fitted model with normal-year degree-days to calculate normalized annual consumption (NAC) for that period. That is, the fitted model was used to predict what the pre and post period energy usage would have been given weather from a given normal year.

The eTools models use normal degree day bases from either the years 1970-2000 or 1980-2010, which are not reflective of current weather trends. Therefore, billing analysis utilized a normalized weather base that is not representative of current weather but is aligned with eTools' weather data. Given the upward trend in temperatures, eTools should utilize weather normal values based on the 10 most recent years of data.

Additionally, EGI was only able to provide a fixed (18°C) base temperature degree-day count, rather than actual normal temperature data for these periods. The billing analysis relies on a variable degree-day base and this analysis cannot use these degree-day counts. Instead, for each weather station to be used, DNV selected a year for which there were temperature data and whose degree day counts at an 18°C base matched the historical normals well. Then the actual temperatures from these years were used as stand-ins for the historical normals to calculate normalized annual consumption and normalized savings.

For each site, the difference between pre- and post-program NAC values (ΔNAC) represents the change in consumption under normal weather conditions. These are the billing analysis estimated savings, referred to as *evaluated savings*.

2.5 Site selection

The following criteria were used to identify the sites for this analysis:

Pre- and post-installation data. The billing analysis involves a comparison of gas usage before and after the boiler measure installation. DNV eliminated any sites without data in the "pre" period (the two years before the installation) or the "post" period (the two years after the installation). The site-level modelling approach also assumes that no other major events (aside from weather) caused changes in gas usage in either the pre or post periods, so sites with other non-boiler measures installed during the analysis period were also eliminated.

Data sufficiency. To be accurate, the modelling approach also requires sufficient data for each site in both the pre- and post-installation periods for a robust linear model. Because of this, sites that had fewer than 10 total data points in either the pre or post period were removed. Additionally, the PRISM approach flexibly chooses a temperature (degree day base) below which the boiler is active and energy use will increase as the temperature decreases. An accurate characterization of the relationship between consumption and heating degree days from an optimal degree day base is essential to the weather normalization process. Therefore, to estimate a robust model, there must also be sufficient data points in this range where energy use is increasing with temperature decrease. Any sites with fewer than six total data points in this temperature range, in either the pre or post periods, were also removed.

Data coverage. The models should capture enough of the pre- and post-period timeframes to accurately represent the site's operations during these periods. Sites without 80% of the days in the pre or post period represented in the data were removed. For example, this rule would remove a site whose data coverage was missing any more than about 5 months of the total 24 months of data targeted. These could be five key winter months which would make a model impossible to reasonably estimate.

Model fit criteria. In addition to having enough data for the models to fit, DNV also chose sites where the models fit well, and therefore are likely to accurately predict how energy use changes with the weather, allowing a good comparison of the pre and post conditions under a normalized weather situation. Using the site-level model discussed above, the adjusted R^2 measure of model goodness of fit was calculated to assess the relative accuracy of models with different degree-day bases.

The adjusted R^2 statistic varies from zero to one, with zero meaning the model does no better than an average, and one meaning the model explains all the variation in energy usage. Sites with a space heat or space and water heat intervention with an R^2 less than 0.8 were eliminated. Sites with a water heat intervention only tended to have lower R^2 values, so to include a large enough sample of these sites, sites with an R^2 less than 0.5 were eliminated.

This selection process left 475 total sites for analysis. A summary of a number of sites retained after each elimination step is shown in Table 2-3.

Table 2-3. Removal of sites due to data insufficiency or model fit

Elimination Step	Sites Remaining
Removing those with other measures during analysis period, and those lacking data during the pre or post period	856
Removing those with fewer than 10 points in either the pre or post period	627
Removing those with fewer than 6 points in the temperature range where energy use varies, in either the pre or post period	623
Removing those with less than 80% of days present in either the pre or post period	564
Removing those with R^2 values less than 0.8 (Space Heat or Space and Water Heat) or 0.5 (Water Heat)	475
Total	**1,097**

Below is the distribution of R^2 values among the 564 sites with sufficient data.

Table 2-4. R^2 distribution of sites with sufficient data

R^2 bin	Number of Sites
Less than 0.5	27
0.5-0.7	36
0.7-0.8	49
0.8-0.9	121
Greater than 0.9	331

The numbers of sites remaining in different categories after the above filters are applied are shown in the Table 2-5.

Table 2-5. Filtered table of simple boiler installations and sites retained for analysis

Sector		Type of Boilers (Installed in a Single Year)		Original Number of Accounts in Each Boiler Combination	Retained Number of Accounts in Each Boiler Combination
		Space Heat	Water Heat		
Commercial		✓		366	153
		✓	✓	33	11
			✓	41	12
Multi-Residential	Low Income	✓		30	22
		✓	✓	50	27
			✓	21	17
	Market Rate	✓		303	144
		✓	✓	148	61
			✓	81	28
	Total	✓		333	166
		✓	✓	198	88
			✓	102	45
Total		✓		699	319
		✓	✓	231	99
			✓	143	57

2.6 Comparison of eTools and Evaluated Savings (Billing Analysis)

DNV received data on 456 projects from EGI, as EGI was unable to find digitized data from approximately 20 projects. Upon receipt of this data, 8 sites had two associated projects and so were dropped, for a total of 440 sites and projects. Two sites where the mismatch between eTools and evaluated savings was a clear outlier compared to the other data were also removed for a final total of 438 sites.[7]

However, as noted in section 2.3, the “exclusion period” established by DNV shifted with the provision of additional information from EGI. As the site sufficiency metrics rely on the amount of billing data before and after the exclusion period, as well as the model results, which will also shift when a different time span is observed, several sites initially used in the Phase 1 analysis were excluded and no longer considered in the updated analysis. Table 2-6 is an attrition table showing how many sites fail to meet the sufficiency criteria after the new, more accurate exclusion period has been applied.

[7] Both dropped sites had very small percentage savings coming out of eTools. Both less than 1.5%. The calculation of difference in fraction savings over eTools saving got very big, one positive, one negative.

Table 2-6. Attrition table of sites used in Phase 1 with sufficiency metrics appropriately applied

Elimination step	Sites eliminated	Sites remaining
Sites used in Phase 1 memo	-	438
Removing those with less than 80% of days present in either the pre or post period	61	377
Removing those with R^2 values less than 0.8 (Space Heat or Space and Water Heat) or 0.5 (Water Heat)	17	360
Removing those with other measures during analysis period	2	358
Removing those with fewer than 10 points in either the pre or post period	2	356
Removing those lacking data during the pre or post period	1	355
Total	**83**	**355**

Following the updated exclusion period analysis, 18.9% (83) of sites used to produce results as part of Phase 1 fail to meet DNV's sufficiency criteria for analysis under the newly applied exclusion periods. The amended Phase 1 results relied on only the 355 sufficient sites shown in Table 2-6.

Most of the newly eliminated sites are due to insufficient days present in the pre or post period. Under DNV's understanding of installation dates and the resulting exclusion periods used in the Phase 1 analysis, project dates in the original dataset trended earlier than the actual reported installation year, which shifted the exclusion window into the past. With the correct, later installation date applied, many accounts lacked sufficient post-intervention data.

Once site sufficiency was established, DNV calculated several metrics to compare eTools-estimated to evaluated savings:

Difference in savings: The difference between each savings estimate in m^3

$$Evaluated\ Savings - Etools\ Savings$$

Difference in savings, as a percent of total usage:

$$\frac{(Evaluated\ Savings - Etools\ Savings)}{Evaluated\ Pre\ Usage}$$

Difference in percent saved:

$$\frac{Evaluated\ Savings}{Evaluated\ Pre\ Usage} - \frac{ETools\ Savings}{ETools\ Pre\ Usage}$$

DNV also calculated a RR, the ratio of total evaluated savings overall evaluated projects to eTools claimed savings for the same projects:

$$\frac{\sum Evaluated\ Savings}{\sum ETools\ Savings}$$

2.7 Phase 1 Results

The reported preliminary RR for the original Phase 1 analysis was 0.70. However, after applying the new project installation dates and modifying the exclusion periods and reducing the population of sites to only those meeting our stated sufficiency criteria given the new exclusion periods, the parallel RR was found to be 0.68. This means that at most only 68% of the savings calculated by eTools showed up in the evaluated savings for the selected sites. Possible explanations for this are explored in the following graphs.

There are multiple possible explanations for differences between the eTools estimates and the billing analysis estimates. The hypothesis (put forward in past CPSV recommendations) that motivated this study is that eTools is overestimating savings. The preliminary results are consistent with that hypothesis.

Also, it has been acknowledged from the beginning of the analysis, pre-post analyses of this sort can be sensitive to NREs or other external trends. While an engineering-based model will always estimate positive savings when provided with input showing an increase in efficiency, variations in consumption and unknown external factors can cause post-installation usage to be higher, or lower, than pre-installation usage even after accounting for weather. Aggregated across all sites, the external factors not accounted for in an engineering model could have a net effect of either more or less savings than initially projected. Finally, the limitations of this analysis approach could contribute to the differences. Specific reasons for potential differences in the evaluated versus eTools estimates that relate to the analysis approach may include:

- Different pre-periods being modelled
- The difference between variable and fixed degree day base models
- The normal-like years used in the evaluation model were not the exact same as the 1970-2000 normals used by eTools.

These analysis-related differences, as well as possible external trends and effects, are unlikely to fully explain the degree of difference in savings estimates leaving a reasonable presumption that eTools may consistently overestimate savings.

The black line in each of the figures below is a 45° line, showing where the data points would be if the two estimation techniques yielded the same results. If the x-axis estimate (DNV-evaluated results) is higher, points will fall below the black line. Similarly, if the y-axis estimate (EGI eTools results) is higher, points will fall above the black line. The blue line in the figures is a linear estimate of the relationship between the two.

In comparing the eTools versus evaluated energy consumption and savings, the analysis first looked at how total consumption values compare. Overall, they are very similar. Figure 2-2 shows that total evaluated pre-project consumption is an average of 2% higher than eTools estimates. The Phase 1 analysis found a difference of 3.75%. By improving the exclusion period definition logic to match measure installation dates more closely, DNV's estimate was closer to the reported eTools value than before.

Figure 2-2. Pre-project consumption

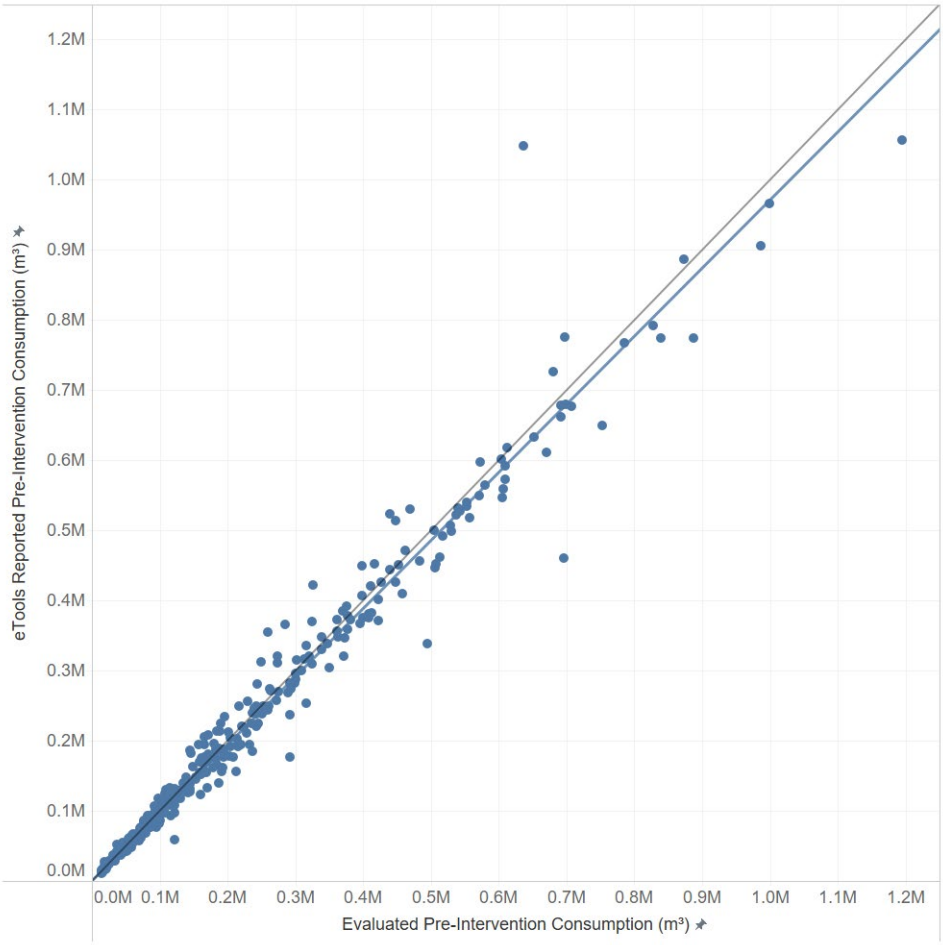
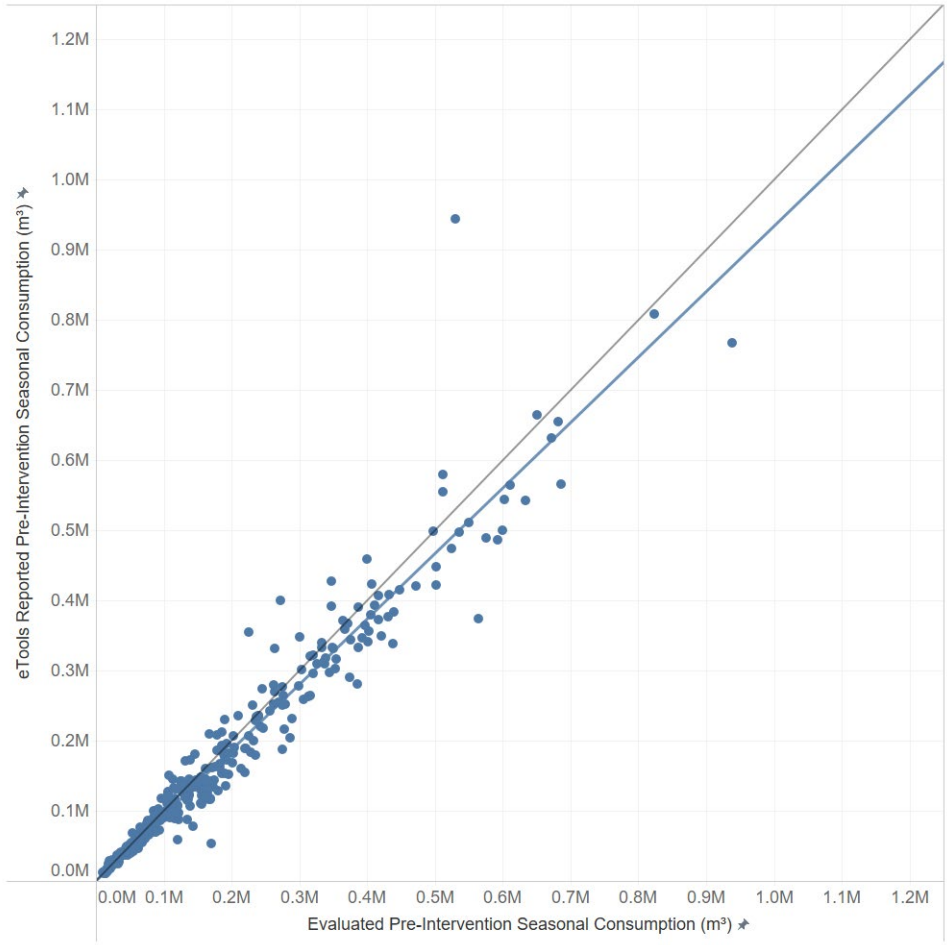


Figure 2-3 shows that the evaluated pre-project seasonal consumption is greater than eTools estimates by an average of 7.4%. The original Phase 1 analysis found a difference of 7.7%, however, utilizing more accurate project installation dates lead to smaller differences between reported eTools figures and evaluated figures than before.[8] Overall, these values show a high correlation between individual site-level estimates across the two methods, but the evaluation approach allocates a greater proportion of consumption to seasonal or weather-correlated consumption.

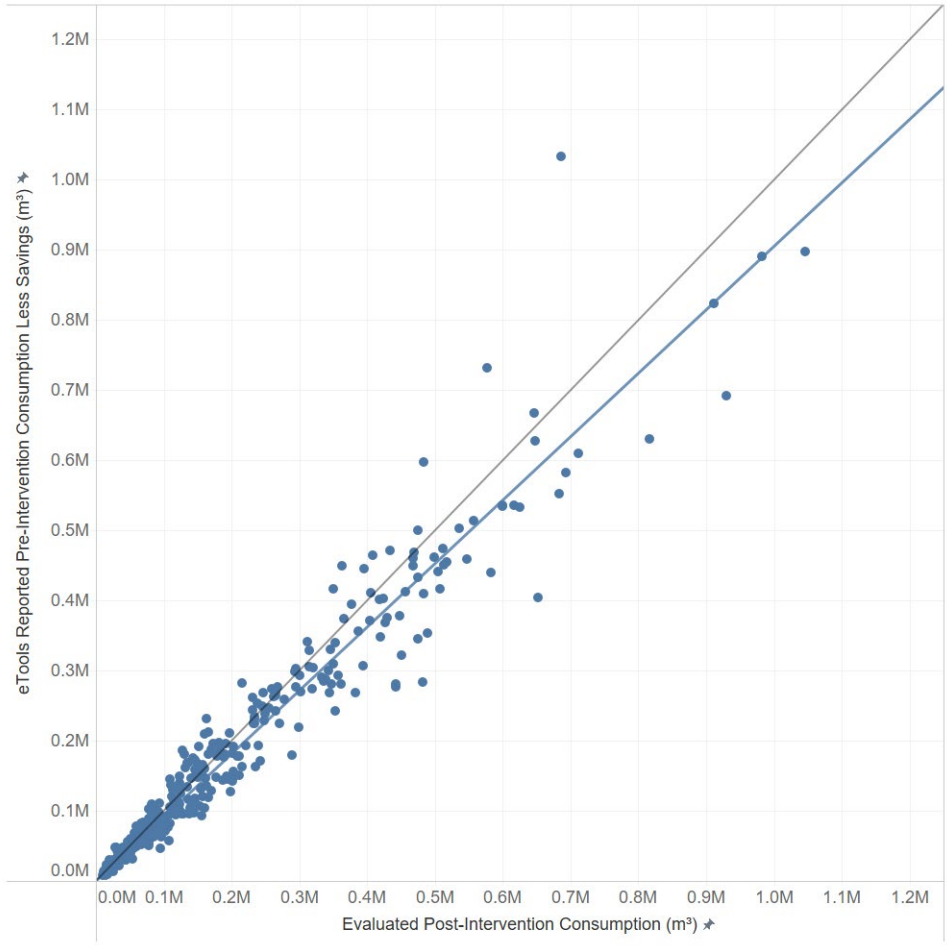
[8] This shift is also likely due to the shift in sample composition associated with the removal of sites no longer meeting sufficiency criteria for analysis. The sites removed from analysis trended towards having lower eTools pre-intervention seasonal consumption relative to billing analysis pre-intervention seasonal consumption.

Figure 2-3. Pre-project seasonal consumption



Because eTools does not provide post-period consumption, it was calculated by subtracting reported savings from a sum of seasonal and non-seasonal pre-period consumption. Figure 2-4 compares DNV's total evaluated post-period consumption using this metric and shows that evaluated estimates are 10.1% higher than eTools estimates, which follows from the lower overall evaluated savings estimates (Figure 2-5). The original Phase 1 analysis found 12.1% higher consumption.

Figure 2-4. Post-project consumption (note that eTools values are calculated)



It is important to note that the evaluated estimates include all observed consumption-related site changes, whether project-related or not, which include operational, behavioral, and other changes. In contrast, eTools calculates quantitative usage changes based on boiler efficiency, utilizing normalized whole-building gas consumption, and engineering assumptions.

Despite these differences in estimation technique, DNV would expect to see some correlation between the engineering estimates and the billing analysis estimates. Billing analysis measures consumption change between pre- and post-intervention periods. Therefore, the operating hypothesis is that a plurality of consumption changes identified via billing analysis is due to the program intervention, on average.

While Figure 2-5 and Figure 2-6 (displaying m^3 saved and fractional consumption saved) appear to show limited correlation between these estimates, a simple regression-based RR (e.g., forced through zero) produces estimates of 66% and 64% respectively, with greater than 90/10 precision. The original Phase 1 analysis found estimates of 62% and 64%.

The points below zero “Evaluated Fraction Saved” indicate that the billing analysis yielded negative savings, or increased gas consumption after the project was completed. eTools, by design, will not yield negative estimates. These sites represent less than 20% of the sites; major outliers will be discussed in the NRE analysis in Section 7.6.

Figure 2-5. Comparison of consumption saved (m^3) with 1:1 trend line

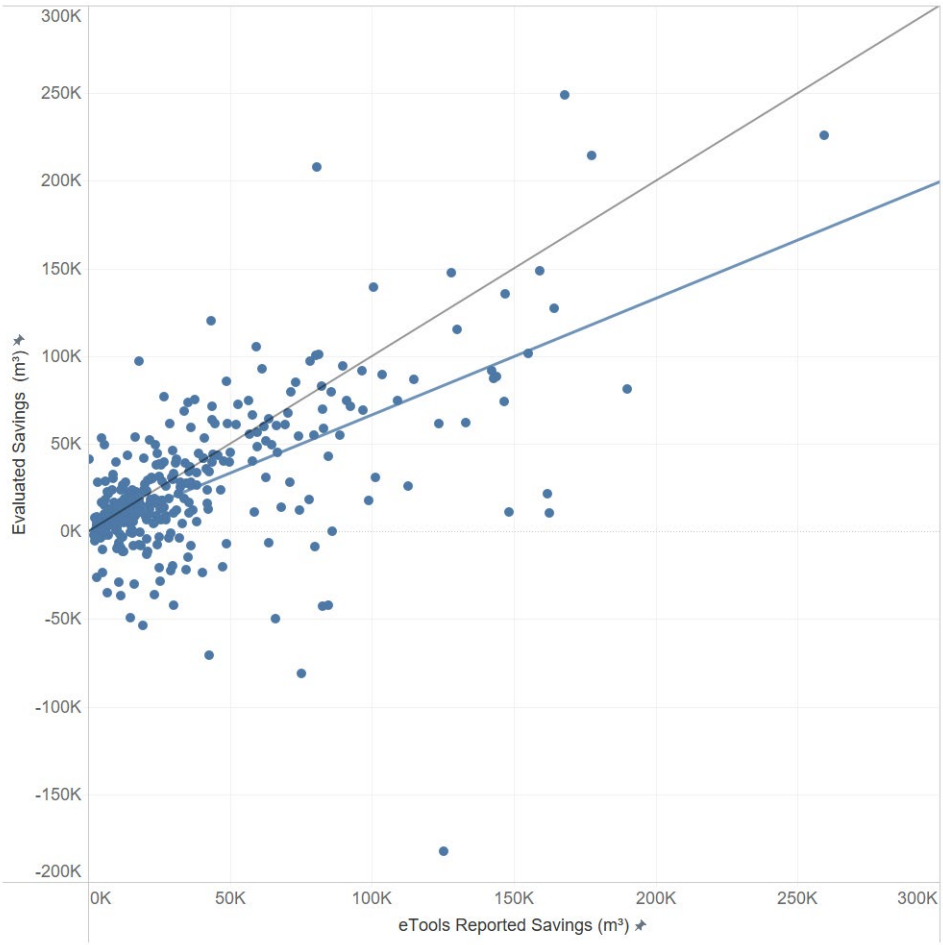


Figure 2-6. Comparison of fraction of consumption saved with 1:1 trend line

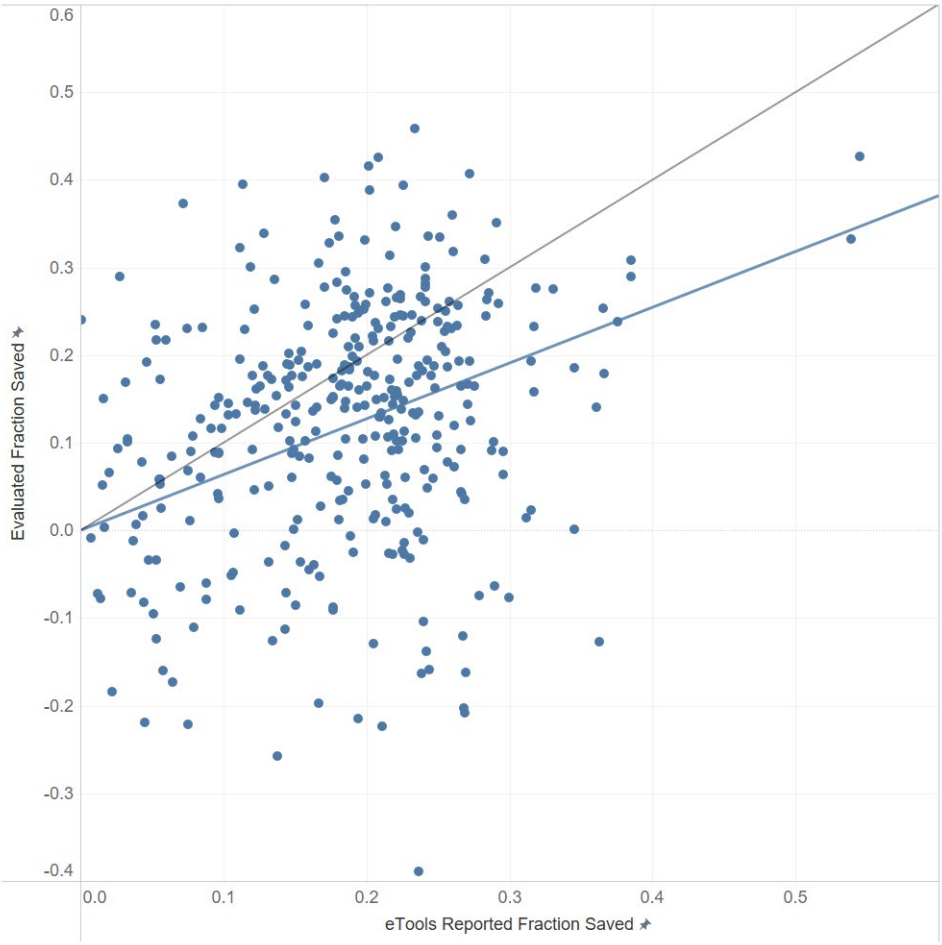
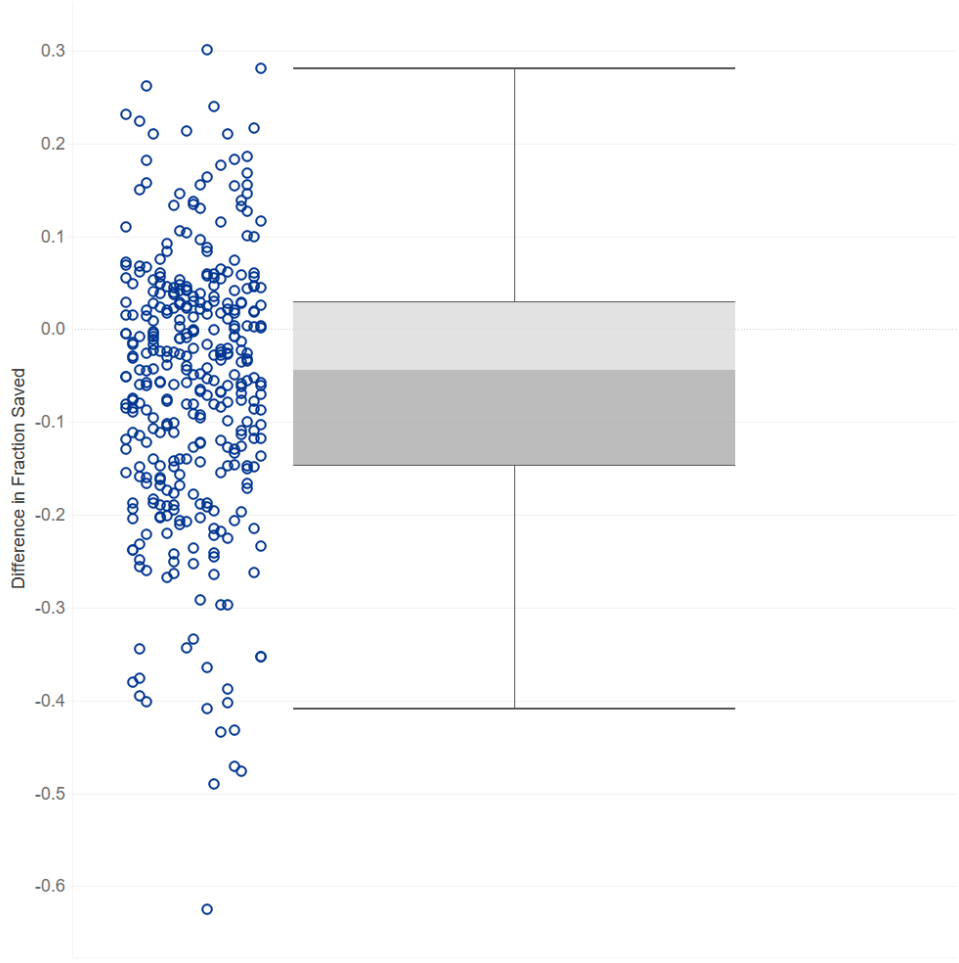


Figure 2-7, similarly, shows the difference between these two fraction-saved numbers, i.e., Evaluated Fraction Saved less eTools Fraction Saved.[9] Thus, if the evaluated fraction saved is greater, this number will be greater than zero; if the evaluated fraction saved is smaller, this number will be less than zero. As expected, given previous results, most points are less than zero, indicating that the evaluation is finding lower savings than eTools, and the spread is large, indicating no consistent level of difference. The horizontal spread simply allows all points to be seen. These results are consistent with plots of pre- and post-installation consumption in Figure 2-2 and Figure 2-4. Pre- and post-installation consumption is 2% and 11% higher than eTools, respectively, driving a roughly 6 percentage point difference in savings.

The spread of difference in fractional savings is not statistically significantly different from that reported in the original Phase 1Phase 1 memo.

[9] The boxplot provides the median (solid line in middle of box), the 25th and 75th percentiles (the box) and 1.5 the inter-quartile range as whiskers. The horizontal dashed line represents the mean, while the dashed triangles delineate the standard deviation.

Figure 2-7. Spread of difference in fractional savings



The next series of graphs explore if some types of projects may show eTools savings closer to evaluated savings. In the original Phase 1 analysis, there was not a highly statistically significant correlation found between different intervention types and the difference in fraction of usage saved; that remains true, and there is no statistically significant difference between the spread of difference in savings by intervention type between the Phase 1 memo and these amended results.

Figure 2-8. Difference in savings by intervention type

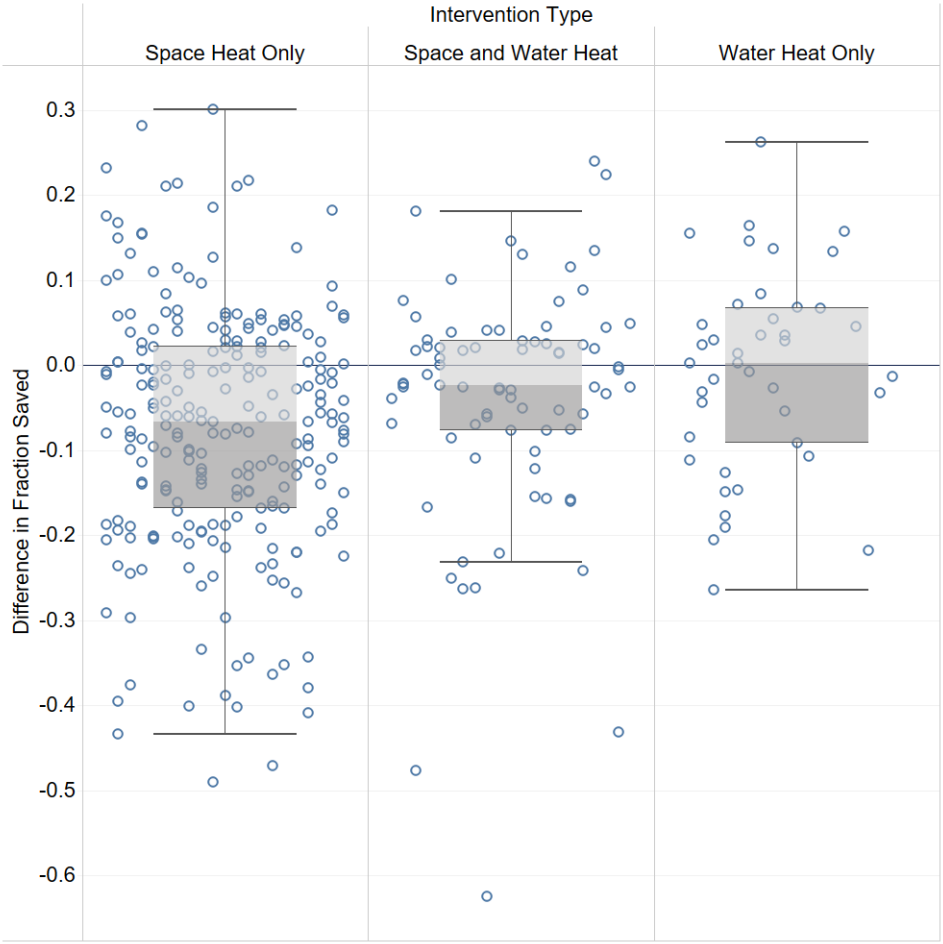
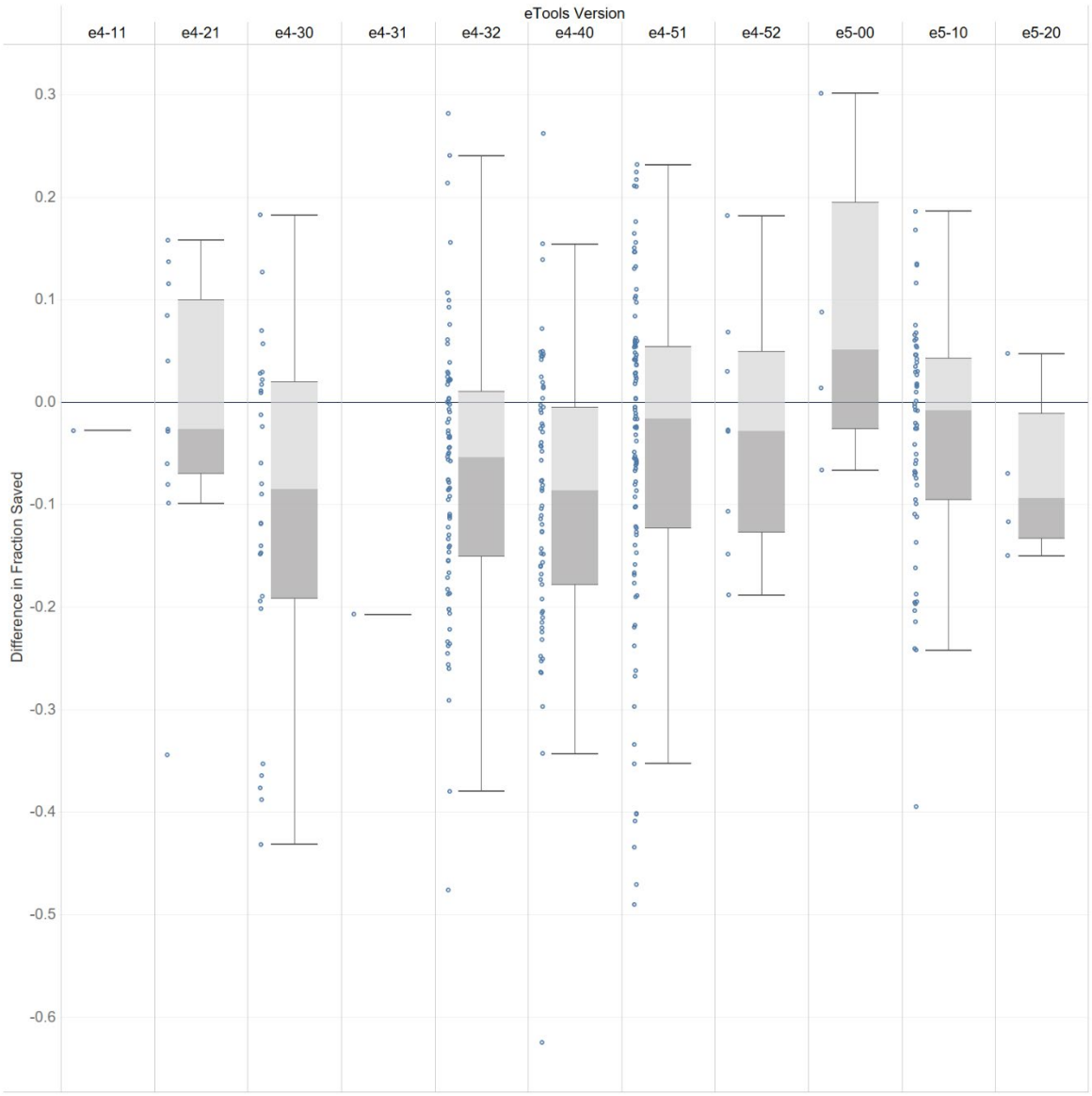


Figure 2-9 shows variation in the difference of fraction saved across eTools versions[10] found in the Phase 1 memo dataset. There is again no significant difference between these new results and those found in the previous Phase 1 analysis.

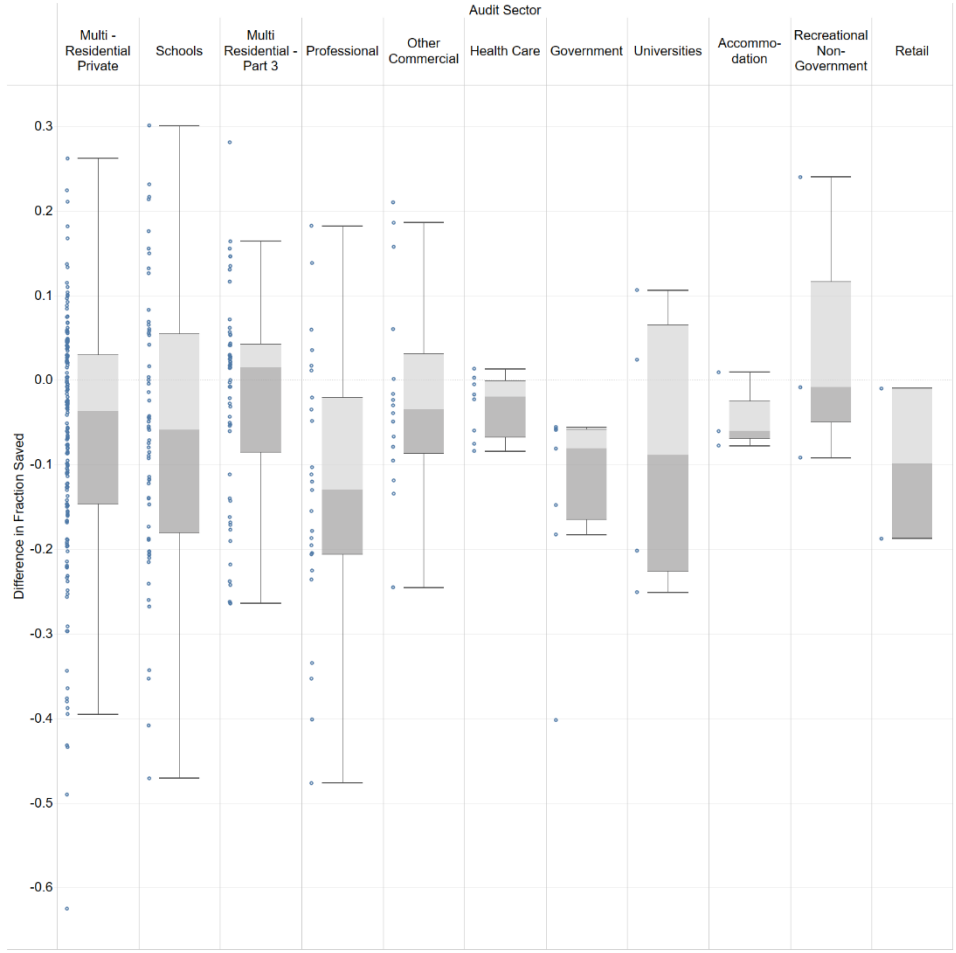
[10] Each eTools version is an update to the modelling software in the form of updates to calculation formulas, default assumptions, weather data, addition of energy saving measures, or bug fixes.

Figure 2-9. Difference in savings by eTools version



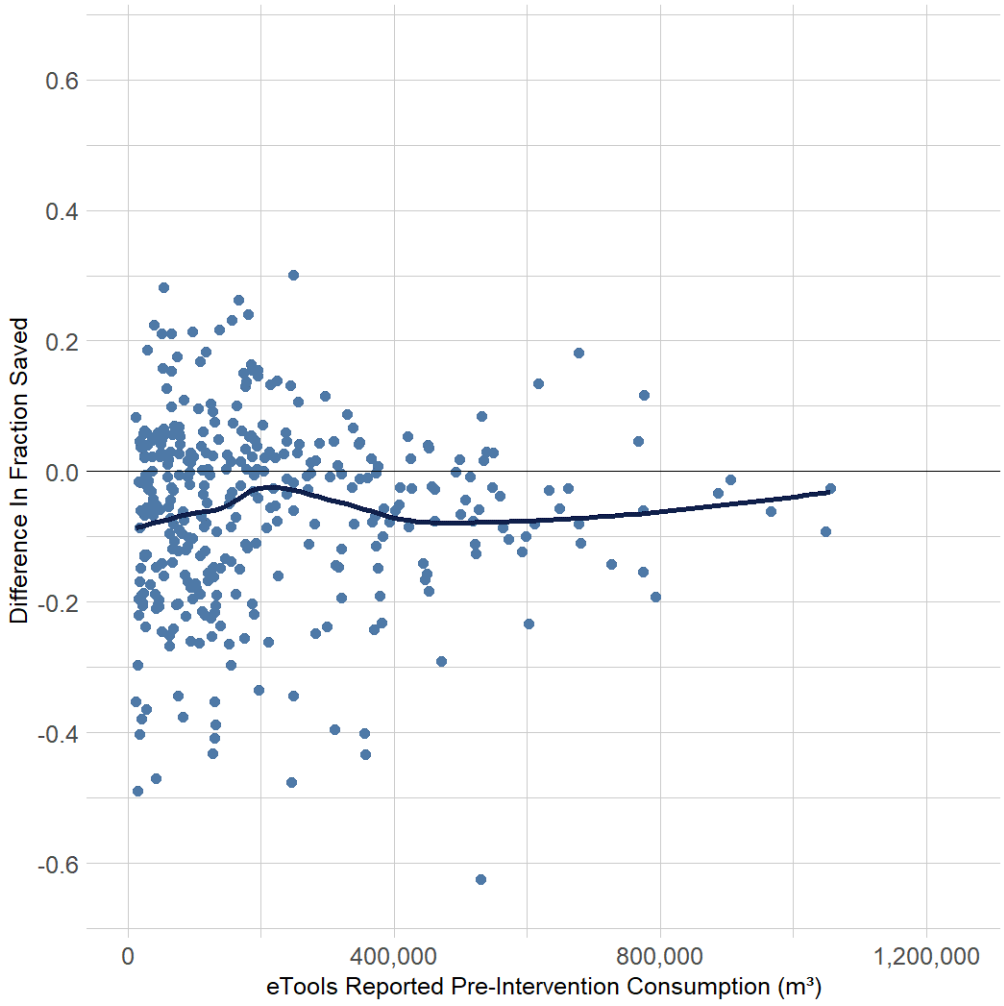
In Figure 2-10, we examine the difference in savings across Audit Sectors. In the original Phase 1 analysis, DNV found that a few Audit Sector categories appeared to perform better, on average: Multi-Residential Part 3, Other Commercial, and Health Care. With the shift in project installation dates, Multi-Residential Part 3 is the only remaining Audit Sector category where eTools savings estimates perform better, on average, than the evaluated savings from DNV's billing analysis; and even in that case, with such a wide spread over zero, it is not an especially significant difference.

Figure 2-10. Difference in savings by audit sector



The LOESS trend line in Figure 2-11 relates the difference in fraction saved for a given site with the eTools reported consumption of that site. The original Phase 1 analysis found a tenuous connection that sites with the greatest pre-program consumption performed worse, on average, than more moderately sized sites. With improved exclusion dates applied, the LOESS trendline shows that for accounts with low and moderately high sized sites, the difference in fraction saved diminishes as site size increases. However, for sites in the middle of the distribution, there is an association with increased pre-intervention consumption and worse model performance. Generally, the relationship shows a trend towards a lower magnitude of difference in fraction saved as site size increases, but a linear regression applied to the data fails to find a statistically significant trend.

Figure 2-11. Difference in Savings by pre-intervention consumption



2.8 Phase 1 Conclusions

The comparison of eTools savings estimates with billing analysis results provides an opportunity to assess the accuracy of eTools. The billing analysis results are a purely empirical change in consumption from the existing technology period to the post-program technology period, controlling for weather. The updated Phase 1 analysis accounts for new information about project intervention dates and filters down to a subset of the sites analyzed in Phase 1 based on their data sufficiency metrics using the newly defined exclusion periods. The findings from Phase 1 of the evaluation are:

- Overall, at most 68% of the savings calculated by eTools showed up in the evaluated savings for the selected sites. This preliminary analysis did not address NREs, though it is unlikely that they could explain this low of an RR. See section 7.6 for analysis and discussion of NRE's in Phase 2. Some additional reasons for potential differences in the

billing analysis versus eTools estimates related to the way the analysis was constructed are listed below. These differences are also unlikely to fully explain the large deviations in savings estimates:

  - Different pre-implementation periods being modelled
  - Differences between variable and fixed degree-day base models
  - The weather normals used in the evaluation model were not the exact same as the 1970-2000 weather normals used by eTools

- Overall and seasonal pre-project evaluated site-level consumption show high correlation with individual site-level eTools estimates despite a difference in trends.
- The difference in trends indicates that the evaluation approach allocates a greater proportion of consumption to seasonal or weather-correlated consumption.
- All RRs were estimated with roughly 90/10 precision, meaning DNV is 90% confident that the true answer falls within the range of +/-10%.
- Comparison of eTools and evaluated savings were conducted for various project characteristics (heating end use, eTools version, and facility type) but at the individual characteristic level no discernible correlations were identified.

A caveat for the billing analysis is that the results are a purely empirical estimate of change in consumption from the existing technology period to the post-program technology period, controlling for weather. The billing analysis savings estimates may include non-program-related events (NRE) that impact consumption, which may obscure the estimated savings of the relevant EEM. Example NREs are as follows:

- Implementation of a control strategy different from the expected ex ante strategy
- Changes to operating schedules (hours of occupancy) or control strategies
- Behaviour of occupants (e.g., adjusting HVAC settings, etc.)
- Building shell renovations and additions, or changes to space usage (changing laundry rooms to gyms, etc.)

NREs are likely a significant driver of the extensive variation in the results at the site level but are unlikely to be primary drivers of the relatively poor RR at the population level. Non-program-related changes can cause either increases or decreases in post-period consumption. While the mean effect of non-program-related changes may make the RR worse, they are unlikely to be the primary driver of the low RR.

In Phase 1, some eTools projects had “replacement” savings in which “standard” units, were used as the baseline. Standard unit efficiency is based on mandated minimum efficiency ratings for newly manufactured units which are often higher than efficiencies of existing units. This was a structural bias in Phase 1 of the evaluation that caused the RRs reported in this memo to be higher than they would have been if only the advancement savings from eTools were utilized. See section 7.3 for discussion of the impacts of advancement savings in the Phase 2 analysis.

Some potential sources of error in the eTools savings include:

- Engineering default assumptions that are inaccurate which could lead to overestimation of savings
- Engineering errors related to interactive effects and additive limitations which could lead to inaccurate savings
- Inability to model complex manual operation of the baseline system. Control strategies like boiler purging, flue gas venting, supply temperature setback, etc. can be implemented manually in the existing system but that information can be difficult to gather or too complex to model in eTools which could lead to overestimation of savings.

Phase 2 is intended, in part, to address the biases from Phase 1, the influence of NREs, and the top two potential sources of error in eTools.

3 PHASE 2

3.1 Phase 2 objectives and approach

The objective of Phase 2 of the project was to identify the reasons that eTools estimates were greater than evaluated savings through engineering review, multivariate analysis, previous CPSV verification findings, and further analysis of Phase 1's sample billing data. This data will enable discussions and decisions regarding the future use of eTools in verification. The approach used in Phase 2 is described below.

3.2 Review of CPSV evaluation year 2019 results

Results from the most recent CPSV evaluation (EY2019) of boilers were used in the following sections 3.6, and 3.7. Further details are provided in those sections.

3.3 eTools version updates

eTools projects utilizing older versions of the calculator were migrated into the newest calculator version (as of January 2022) e7-00. Re-running older projects in the newest calculator was necessary to ensure results reflect the performance of the current eTools calculator and eliminate the potential variability in savings due to a mix of prior versions.

A newer version of eTools (e8-00) was released by EGI in March 2022, during Phase 2 of the study. A non-random sample of projects was updated to e8-00 to determine if there were significant differences in savings between e7-00 and e8-00. A significant difference in savings would warrant updating all projects to e8-00. The sample of projects updated to e8-00 resulted in negligible differences (<1%) in savings between their e7-00 and e8-00 counterparts. Therefore, e7-00 was utilized for the remainder of the Phase 2 study.

3.4 Extraction of eTools advancement savings

A secondary goal of updating savings for eTools projects utilizing the latest version was to extract advancement savings for all projects. Advancement savings are based upon the comparison of the consumption of the proposed boiler systems to the consumption of the existing boiler systems; these savings are more accurate for comparison to billing analysis results because of the common baseline between the two methods. The dataset utilized in Phase 1 contained only reported savings which were a mix of advancement and non-advancement savings. Many of the earliest projects included in the sample for this study utilized versions of eTools that did not always calculate advancement savings that could be extracted. Therefore, updating these projects to e7-00 enabled advancement savings to be extracted for all projects.

3.5 Adjusting existing boiler default efficiency

eTools utilizes a default thermal efficiency of 73% for existing boiler systems for which nameplate thermal efficiencies are unknown. This is significantly lower than the industry standard seen in most Technical Reference Manuals (TRMs) which often utilize 80% thermal efficiency as their baseline efficiencies for all replacement scenarios. To investigate the accuracy of this assumption, the thermal efficiencies of all existing boiler systems that did not utilize the default efficiency were reviewed. The efficiencies were then weighted by total system input capacities to determine the weighted average efficiencies for Space Heating (SH) and Domestic Hot-Water (DHW) systems. Results are displayed in Table 3-1.

Table 3-1. Existing non-default boiler thermal efficiencies

System Type	Total Project Count	Non-Default Project Counts	Min Thermal Efficiency (%)	Max Thermal Efficiency (%)	Weighted Average Efficiency (%)
Space Heating (SH)	369	92	58.0	97.0	80.1
Domestic Hot-Water (DHW)	188	85	70.1	97.0	81.8

The resulting efficiencies were more than seven percentage points greater than eTools' default efficiency. The weighted average efficiencies were utilized as default efficiencies to update advancement savings in projects that used default efficiency for existing boilers.

3.6 Adjusting proposed boiler settings

A review of the results from CPSV EY2019 revealed that the most common verification adjustments made to eTools boiler projects (based on customer reported information and data gathered from site visits) were as follows:

- Changes to boiler loop temperatures
- Changes to pumping, purge, and flue controls

In most cases, the changes were reversions of proposed setpoints and controls to those of the existing system. To investigate the potential overestimation of savings caused by overly ideal assumptions used for system commissioning and site operations, the values for the aforementioned parameters in the proposed systems were set equal to their existing system counterparts.

3.7 Non-routine events investigation

Data collected from CPSV EY2019 evaluation revealed only 2 of 18 boiler projects reported potential NREs. One site reported pipe insulation on their SH and DHW systems after the boiler projects, which should increase billing analysis savings compared to eTools. The second site reported no NREs at the time of the evaluation but mentioned that there could be future increases in gas load, due to a potential new building, which should decrease billing analysis savings compared to eTools savings. As evidenced by the customer-provided information noted above, NREs can have effects on system consumption in either direction. The aforementioned sites were not included in the study's sample; therefore, it was not possible to determine the manifestation nor impacts of the expected NREs.

Additionally, analysis of consumption load shapes for sites with negative modelled savings and sites with high magnitudes of difference in fraction saved between eTools results and our evaluated savings was performed. Figure 3-1 shows the load shapes of the sites with the five highest and lowest differences in fraction saved between the savings produced by billing analysis and those reported by eTools. These 10 sites represent the largest outliers in the findings, but a visual inspection shows that there are no noticeable anomalies present.

Some sites do contain some bill periods where average daily consumption rises or falls significantly, but the patterns observed are repeated in both the pre and post periods. Sites, such as site 11, see a shift from zero usage in the summer to high usage in the heating season, but this trend is present in both pre and post periods.

Figure 3-1. Load shapes of top and bottom five sites with greatest magnitude of difference in fraction saved

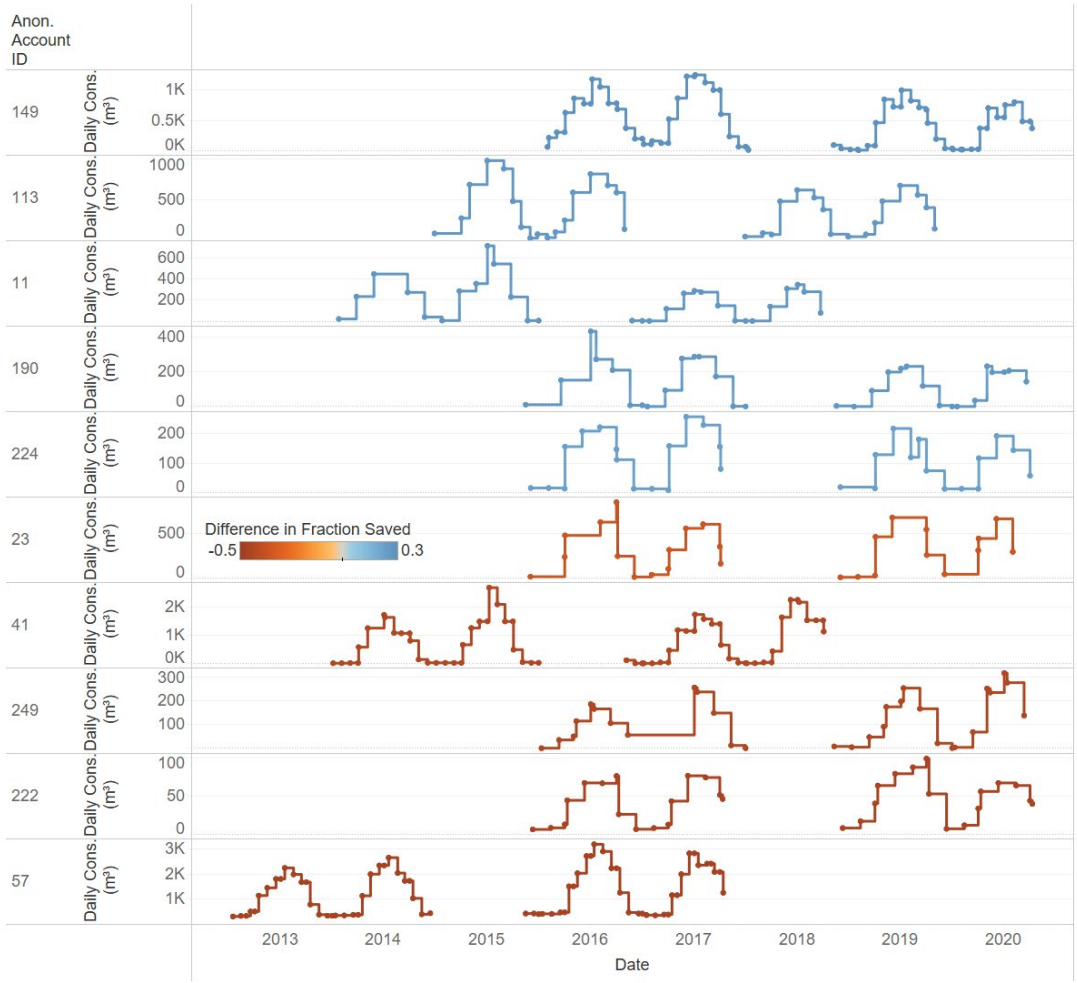
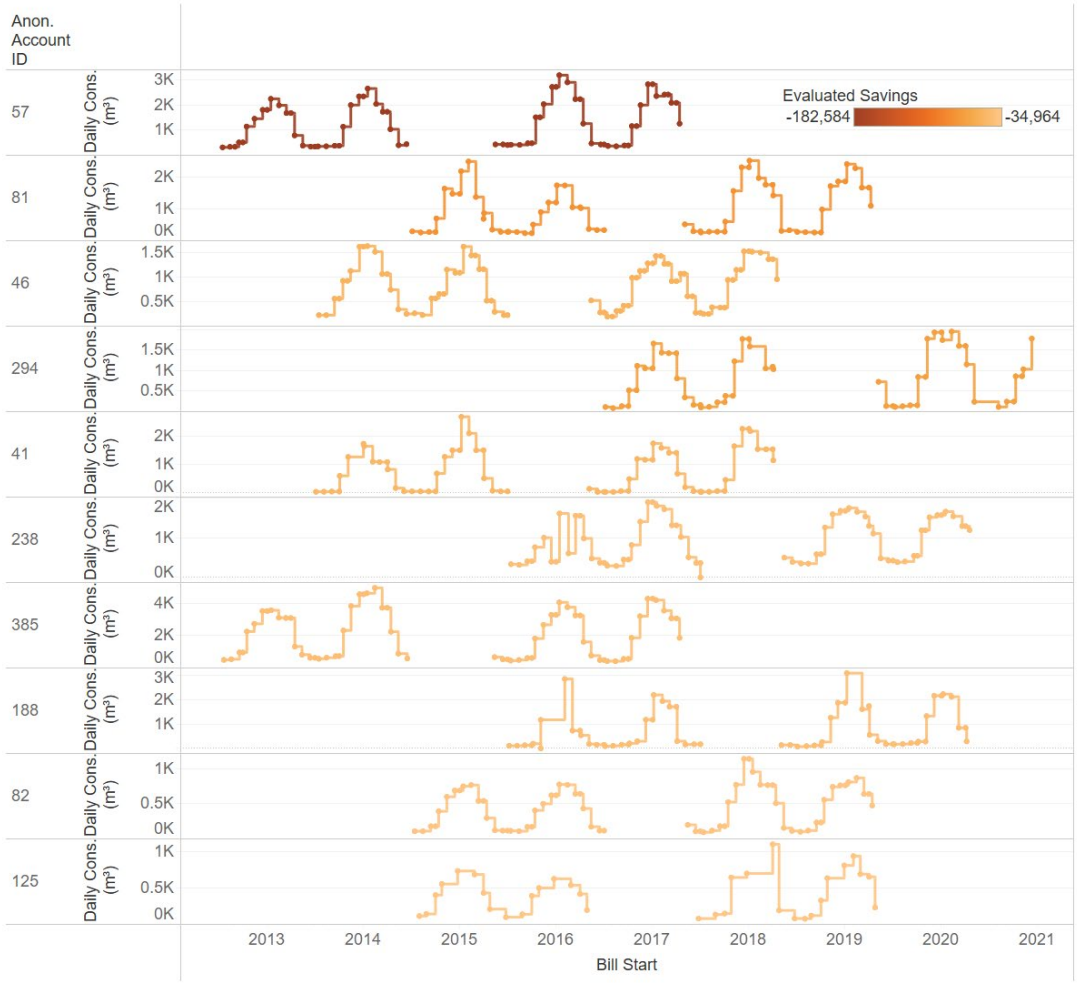


Figure 3-2 likewise shows the five sites with the greatest magnitude of negative savings from DNV's evaluation. Again, these sites show no significant discrepancies between pre period data and post period data that would suggest the presence of NREs. While some of these sites' billing data contained payment periods with long durations (such as site 188 and site 125), no statistically significant relationship can be established between the length of bill periods and the evaluated savings or the difference in fraction saved.

Figure 3-2. Load shapes of 10 sites with the least evaluated savings



3.8 Comparison of consumption normalization methodologies

An investigation into the differences between the consumption normalization method implemented in eTools and the method utilized in billing analysis was conducted. The following are findings about the eTools methodology:

- eTools suggests a baseload (non-seasonal use) value, from the billed consumption data. This is selected as the lowest consumption value, but it is up to the user to utilize the suggested value or select a different period.
  - Because some facilities (schools, etc.) can have zero summer consumption, manual baseload values can be entered.
  - Baseload can be selected by eTools from a different billing year than the data selected for the seasonal baseload.
  - Baseload does not currently account for the potential seasonal change in DHW usage.
  - Other potential baseloads (besides DHW) are estimated via engineering assumptions and subtracted from the eTools suggested baseload.
- There were often temporal differences between the billing period, meter read date, and actual HDD weather data used.

  - For example, a meter read date in February could represent consumption in December and January but would use HDD from February.
  - This issue is present in versions of eTools up to e7-00 but was corrected in e8-00. Our investigation showed no quantifiable impact of this correction on normalized consumption values which are equal for the sample of projects updated to e8-00.

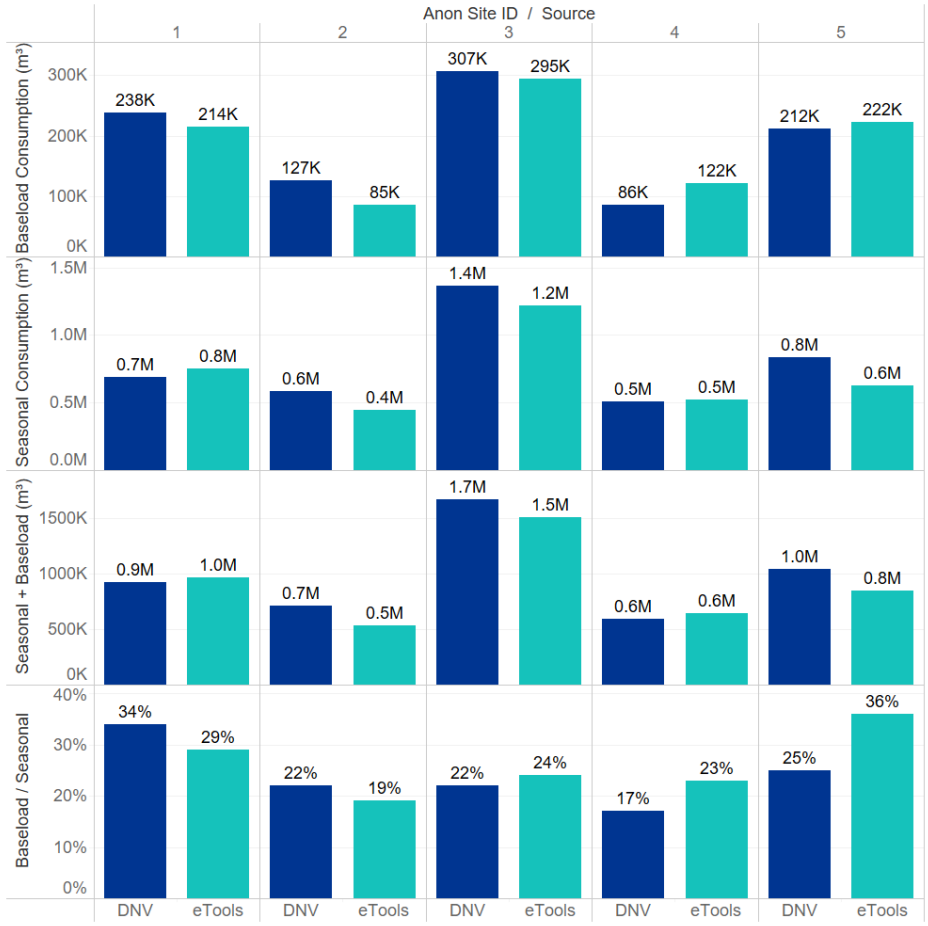
- Because the baseload is removed manually, the seasonal consumption regression equations are constrained to a zero-intercept due to the baseload being removed in prior steps.
- Annual actual weather seasonal consumption is calculated using the regression. That number is weather normalized by the application of a linear scalar of the ratio of normal to actual HDD. This is an unfamiliar but satisfactory approach made possible by the manual separation of the baseload.
- eTools maintains monthly values, adjusting them with pre-set monthly profiles meant to attempt to account for non-heating months with nominal HDDs and to account for building HVAC schedules.
  - It is unclear how the monthly values feed into the wider calculation of savings. Basic weather normalization occurs at the annual level.
  - No sources or documentation were provided for the values of the monthly pre-set profiles, nor the logic behind their application
- When there is insufficient billing data the estimated average daily consumption utilized in the regression gets the same weight same as all the other data points. The industry standard practice is weighting by the number of days in a billing period.

In summary, eTools utilizes a methodology with some departures from industry standard practice. EGI was unable to provide documentation explaining the reasons behind their departures from standard practice, so in many cases we could not confirm the rationale. These departures from standard normalization methodology raised doubts about the accuracy of the baseload and seasonal values resulting from it. Specifically, they created concern that the baseload savings were being underestimated, while the seasonal load was being overestimated. In fact, comparison of evaluated versus eTools seasonal load belies this concern. Furthermore, the overall small difference between evaluation and eTools pre-period consumption indicates that methodological differences did not lead to substantially different estimates of consumption.

A further investigation looked at billed consumption data, actual weather data, and normal weather data manually extracted from eTools for a sample of sites. Because manual extraction was necessary, only a small sample of five could be assessed. DNV's normalization process was applied to the data from the sample sites and no conclusive directional bias was identified for the normalized season loads being generated by eTools. The seasonal loads generated from this analysis were both greater than and less than their eTools counterparts, see Figure 3-2.

Overall, while we have some concerns with the approach used in eTools for consumption data normalization, the small sample of sites we could look at in detail did not provide evidence that a clear bias was being introduced by the approach.

Figure 3-2. Differences in seasonal and baseload consumption calculated by eTools and DNV



3.9 Multivariate regression analysis

Phase one considered the divergence between the billing analysis and eTools individually across several characteristics without discovering any obvious individual drivers of the differences. It is possible that multiple variables could have a combined effect on the divergence of eTools estimates from billing analysis estimates. In this case, the joint effect of these variables could be difficult to see in those individual, bivariate comparison graphs. To explore this possibility of a joint effect across multiple characteristics, a multivariate linear regression was conducted to see if multiple variables affect the divergence in ways that were not obvious individually.

The multi-variate analysis resulted in the variables, shown in Table 3-2, being statistically correlated with eTools advancement savings greater than billing analysis savings. Further investigation was conducted to dig deeper and identify any sub-variables that may be statistically correlated with the overestimate of savings, but the model did not identify any.

Table 3-2. Variables correlated with eTools' overestimation of savings

Variables	DESCRIPTION	Percentage of Phase 2 sample	RR	Fractional Savings
AHU	Flag for presence of AHU in baseline or proposed	28.4%	67.6%	17.4%
SH_LL	Flag for proposed lead-lag control in space heating system	13.4%	59.5%	15.7%
Comb_New	Flag for proposed combined space heating and domestic hot water systems	17.8%	66.3%	18.6%

3.10 Interactivity with evaluation adjustments

In the Custom Program Savings Verification (CPSV) evaluations, the gross realization rate (GRR) represents the ratio of the savings verified by the evaluation to the savings claimed (or reported) by the utility, as shown in the following equation. A 90% GRR means the verified gross savings for the project or program were 90% of the claimed savings. Differences between claimed and verified savings for each project can arise for a number of reasons, usually related to differences in forecast assumptions, differences in underlying facts, or differences in calculation approaches or parameters.

$$gross\ realization\ rate = \frac{Evaluation\ verified\ savings}{Utility\ reported\ savings}$$

The gross realization rate in CPSV has historically included adjustments for findings (related to characteristics and control settings of the existing or efficient boiler systems) that in theory would also affect the results of the billing analysis, which creates a risk of double counting of adjustments if a realization rate from this study were also applied. DNV investigated this potential double counting between billing analysis findings and previous adjustments from past evaluations. There were two potential pathways available.

- Plan A: focus on CPSV sites that overlapped with the eTools billing analysis sample
- Plan B: review all historic CPSV sites and separate out adjustments that would be captured by billing analysis

After investigation, Plan B was selected as the optimal path forward, because the estimated overlap of CPSV sites with eTools study sample was approximately 3%. The estimate was based on finding only 41 commercial boiler projects from the

past three rounds of CPSV (2015-2018 program years), and that the eTools study used only 25% of the original population of sites.

For Plan B, each of the previously evaluated 41 eTools commercial boiler projects from 2015-2018 were reviewed and the CPSV adjustments were categorized into: those that billing analysis would capture, i.e., most adjustments to the characterization and control settings on the existing or efficient boilers and those that billing analysis would NOT capture, such as most adjustments solely to the “standard” boiler characteristics, changes to advancement period length, or measure life. After categorizing the adjustments, the CPSV realization rates for each project were updated to reflect only the adjustments that do not overlap with billing analysis. Sixteen projects required adjustments to CPSV RR, shown in Table 3-3. The other 25 projects had no adjustments (100% RR).

Table 3-3. CPSV RR adjustments

Year	Measure ID	Measure Description	Adjustment Category	CPSV RR	Without Double Counting RR
2016	RA.LC.MR.145.16	Boiler - Hydronic Condensing	Existing, Installed	89%	100%
2016	RA.LC.MR.215.16M	DHW boiler	Existing, Installed	142%	100%
2016	RA.LC.MR.191.16A	Space heat and DHW boiler	Interactivity	111%	100%
2016	RA.LC.COM.OTHER.003.16M	Space heating boiler	Existing	136%	100%
2017-2018	RA.CT.18.0335	SH Boiler replacement	Existing, Installed	131%	100%
2016	RA.LC.MR.202.16	Space heating boiler	Installed	100.20%	98.30%
2017-2018	RA.CT.18.0191	High-efficiency space heating boilers	Installed	97%	100%
2017-2018	RA.CT.18.0330	DHW boiler replacement	Installed	137%	100%
2017-2018	LW.CT.18.0008	DHW Boiler Replacement	Installed	90%	100%
2017-2018	RA.CT.18.0215	Conversion from separate to combined SH/DHW boiler	Installed	94%	100%
2017-2018	RA.CT.17.211	High-efficiency, space-heating boiler replacements	Installed	94%	100%
2016	RA.LC.MR.172.16M	Boiler - Hydronic High Efficiency	Installed	144%	123%
2016	RA.LC.MR.204.16	Space heating boiler	Installed	100.20%	101.2%
2017-2018	RA.CT.18.0303	Replaced separate SH and DHW boilers with boilers that serve both loads	Installed	98%	100%
2017-2018	RA.CT.18.0589	Replacement of 2 SH boilers	Installed	93%	100%
2017-2018	RA.CT.17.422	Upgrade to two condensing space-heating boilers	Installed	119%	100%

After separating the adjustments for the 41 sites DNV expanded the results to the population using ratio estimation, which is the standard approach used for sample expansion in CPSV. The ratios estimated are described in the formulas below.

Notation: The following terms are used in calculating the adjustment factors:

G_{Tj} = tracking estimate of gross savings for measure *j*

G_{T8j} = eTools version e8-00 tracking estimate of gross savings for measure *j*

G_{Fj} = full engineer verified estimate of gross savings looking at all adjustments for measure *j*,

G_{NBj} = engineer verified estimate of gross savings looking at only adjustments that do not overlap with billing analysis for measure *j*,

w_{Vj} = weighting factor for measure *j* used to expand the CPSV sample to the full population

V = number of measures in the CPSV sample

G_T = tracking estimate of gross savings for the population of boilers studied

G_V = verified estimate of gross savings for the population of boilers studied

R_E = billing analysis adjustment estimated in phase 2 of this study

The Full CPSV gross realization rate R_F is calculated directly:

$$R_F = \frac{\sum_{j=1}^{V} G_{Fj} w_j}{\sum_{j=1}^{V} G_{Tj} w_j}$$

The overlap factor R_O is calculated as a ratio of non billing analysis verified savings and full CPSV verified savings:

$$R_O = \frac{\sum_{j=1}^{V} G_{NBj} w_j}{\sum_{j=1}^{V} G_{Fj} w_j}$$

To calculate verified savings we can multiply the three realization rates R_E, R_F, and R_O with the gross tracking savings

$$G_V = G_T \times R_E \times R_F \times R_O$$

Alternatively, we can calculate the non-billing realization rate R_{NB} as a ratio of non billing analysis verified savings and tracking savings:

$$R_{NB} = \frac{\sum_{j=1}^{V} G_{NBj} w_j}{\sum_{j=1}^{V} G_{Tj} w_j}$$

And then to calculate verified savings we can multiply R_E and R_{NB} with the gross tracking savings

$$G_V = G_T \times R_E \times R_{NB}$$

The first formula is preferred if the evaluator and the EAC choose to use the overlap factor (R_O) from this study rather than calculate from the CPSV sample itself. For example, if future CPSV sample of commercial boilers is small then this formula may be preferable.

The second formula is preferred if the evaluator and the EAC choose to rely solely on the CPSV sample and not use the overlap factor (R_O) from this study. Assuming the CPSV engineering data collection is conducted in a manner consistent

with historical precedent, then the additional marginal cost for calculating the overlap factors during future CPSV are negligible in comparison. This formula is preferred if sample sizes are large enough that the evaluation team and EAC feel comfortable that the result will be reliable.

This study's results are applicable to eTools version e8-00. As the program moves into more modern versions of eTools beyond e8-00 it will be necessary to calibrate the new version(s) of the tool to e8-00 as well to ensure major calculation changes between versions do not result in double counting. This calibration factor is not included in the above formulas, but would also be a multiplier in calculating G_V , based on CPSV sample/backup sites and calculated as the ratio of e8-00 savings to the savings from the more modern tool. In this scenario both tracking and evaluation use the modern version of the tool throughout and a correction factor for updated eTools version is calculated:

$$R_{V8} = \frac{\sum_{j=1}^{V} G_{T8j} w_j}{\sum_{j=1}^{V} G_{Tj} w_j}$$

Table 3-4 shows the Full CPSV gross realization rate (R_F), overlap factor (R_O), and non-billing realization rate (R_{NB}) calculated using the 41 boilers that were in the previous 3 rounds of CPSV. The case weights from the original studies were used and are interpreted as the number of projects that a sampled site represents in the population studied. Precisions provided are not finite population corrected (FPC Off), which is appropriate for ratios that are intended to apply to a future population rather than the specific population studied.

Table 3-4. CPSV RR and CPSV RR adjustment factor

Ratio	n Measures	Ratio	+/- at 90% Confidence, FPC Off	Relative Precision at 90% Confidence, FPC Off
Full CPSV gross realization rate (R_F) (for reference)	41	102.16%	5.1%	5.0%
Overlap Factor (R_O)	41	97.39%	3.6%	3.7%
Non-billing realization rate (R_{NB}) (for reference)	41	99.50%	3.8%	3.9%

3.11 Phase 2 results

The impacts of the adjustments and investigations described in Phase 2 were as follows:

- Updating all sampled projects to version 7 resulted in an increased RR of 75%.
- Switching to comparing to only Advancement Savings resulted in a decreased RR of 55%.
- Re-setting the default existing boiler efficiency to values of 80.1% for SH and 81.8% for DHW resulted in an increased RR of 70%.
- Re-setting the proposed boiler controls to existing settings resulted in an increased RR of 79%.
- eTools departs from standard practices in several ways with respect to weather normalization, the exact impact of the weather normalization process on eTools results is difficult to quantify but appears to be limited.
- The multivariate regression analysis did not identify any further specific variables that explain the remaining difference between eTools estimates savings and evaluated savings.
- The analysis of NREs did not identify any systematic impact of NREs.

The remaining unexplained difference between eTools estimates and evaluated savings is an 11 percentage point difference between evaluated fraction saved and eTools v7 advancement fraction saved, Figure 3-4. That is, with the adjustments to eTools described above, and using the most up to date eTools version, eTools still overestimates savings relative to evaluated savings by 2.1 million cubic meters, or 27%, based on the most recently audited year, 2020.

The final sample for Phase 2 was 321 accounts, a sub-set of the Phase 1 accounts whose eTools projects were able to be successfully updated to the latest eTools version. Figure 3-3 displays the realization rates, reported savings, and advancement savings across the various eTools versions (and iterations) from this study. The "…All Savings" columns incorporate a mix of baselines, existing and standard. Columns labelled "…All Advancement" use only the existing baseline which is a more apt comparison for the billing analysis results which use the existing baseline. The columns containing "…+ Efficiency" incorporate the default efficiency changes explained in Section 3.5, and the column containing "…& Controls" also incorporates the system controls changes explained in Section 3.6. Retrospectively, without the recommended parameter updates, the RR is 55%. With the recommended parameter changes, a forward-looking RR of 79% is appropriate.

Figure 3-3. eTools version, advancement, and parameter update savings comparison

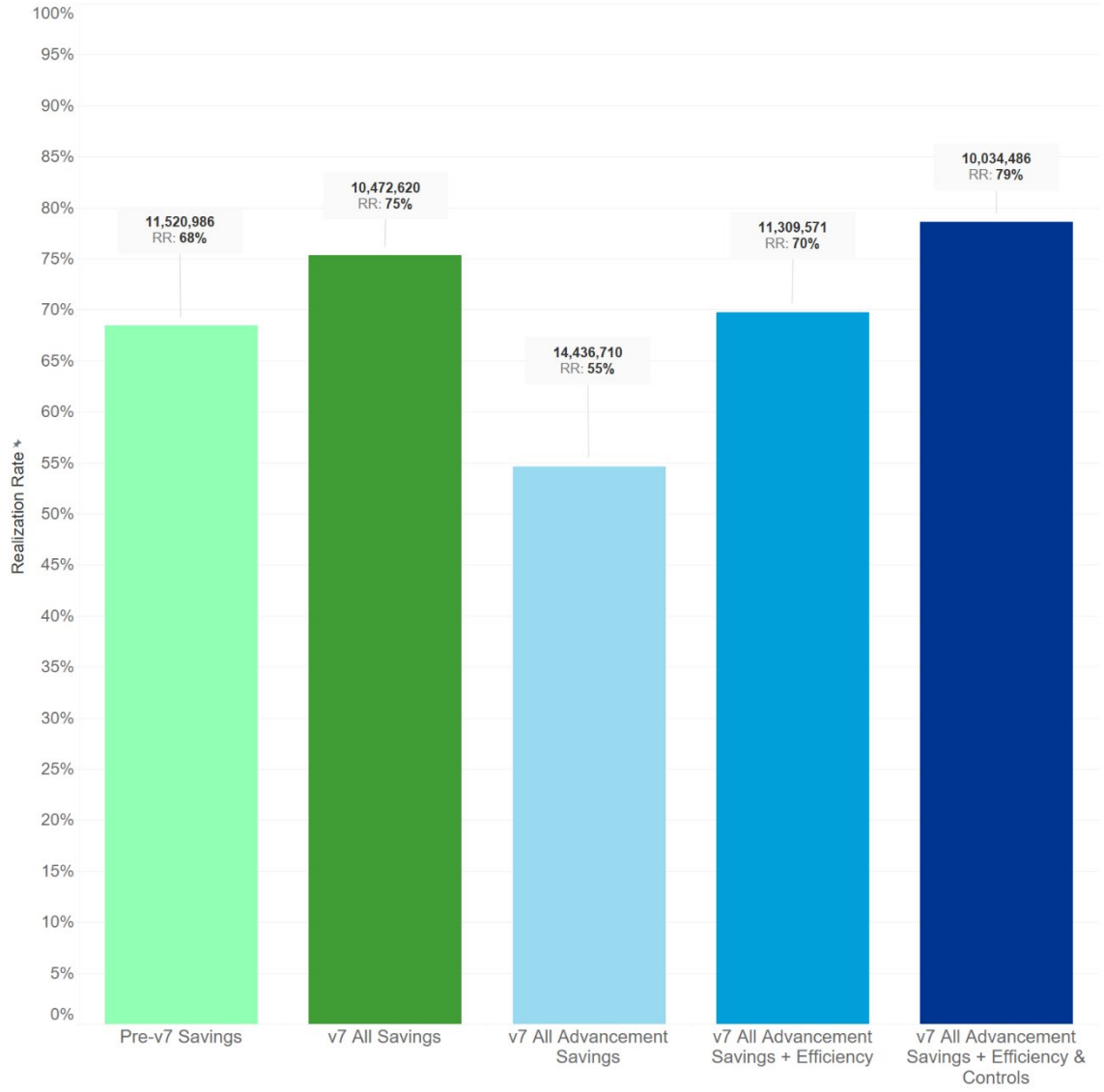
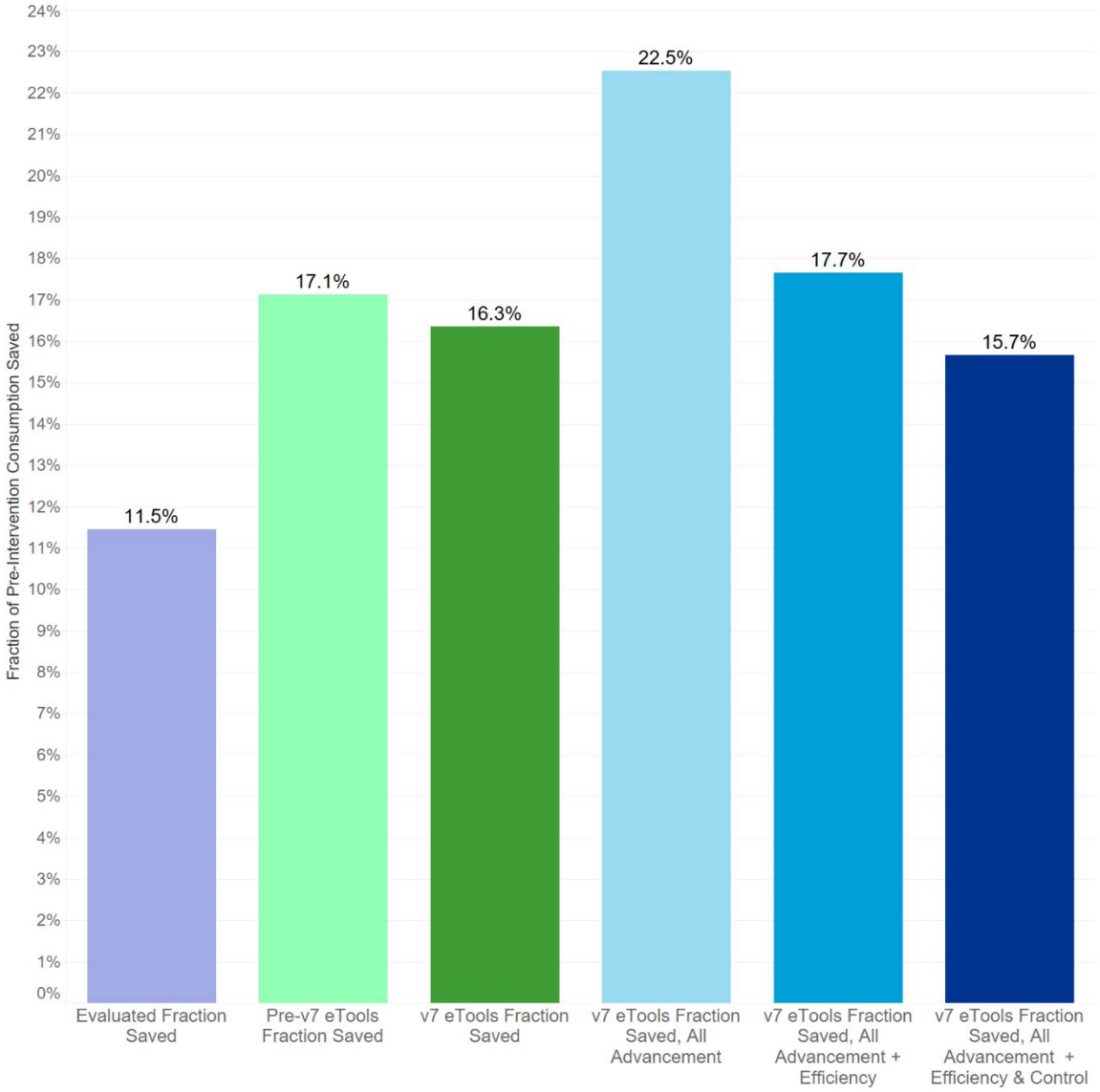


Figure 3-4 focuses on the fractional savings, i.e., savings as a percentage of pre-intervention consumption. The final difference between the fractions saved for evaluated (billing analysis), and eTools v7 advancement + efficiency & control changes is only 4.2% of consumption. If NREs are the cause of the difference between the two methods (evaluated and eTools) then they would have to account for an increase in consumption of 4.2% of pre-intervention consumption across all sites in the Phase 2 sample.

Figure 3-4. eTools version, advancement, and parameter update fractional savings comparison



EGI contracted with evaluation consultant Demand Side Analytics to perform a comparison group analysis to assess trends and NREs. Such a study intends to determine if there exists a general trend in consumption that would bias billing analysis results. Such a trend, as estimated from non-participant changes in consumption, would provide an estimate of the effect of general trends in usage as well as of all kinds of NREs except those participant NREs associated with program participation (but not tracked) which would remain unaddressed in this attempt to address potential NRE bias. The analysis involved identifying a group of similar non-participant sites, finding a match for each participant among those non-participants based on pre-period consumption and then looking at the change in non-participant consumption pre- to post- based on the participant installation date. DSA replicated the process on random subsets of the overall identified non-participant population to develop a distribution of possible consumption changes over time from different comparison group compositions. The results of this billing analysis of program non-participants (Appendix #) by EGI found consumption increases between 0.3-1.2% of weather normalized pre-period consumption with a mid-point of 0.8%. If the findings of the EGI study are assumed to hold true for the sample of accounts utilized in this study then the difference in fraction saved

would decrease from 4.2% to 3.4%, a reduction of 19%. If the increase in post-period consumption from EGI's study is incorporated into this study's evaluation results the Phase 2 RR increases from 0.79 to 0.84. In summary, it is unlikely that any additional studies of consumption trends will find an increase in gas consumption large enough to conclude that NREs account for the remaining difference between billing analysis and eTools results.

Table 3-5 displays the pre-intervention consumption values used in the preceding figure. The eTools consumption values decreased from pre-v7 to v7 because the weather normals were updated to utilize more recent data.

Table 3-5. Pre-intervention consumption for fractional savings

Source	Pre-Intervention Consumption (m3)	Notes
Evaluated (Billing Analysis)	68.84MM	-
eTools pre-v7 (Original Reported Savings)	67.29MM	Weather normals from 1971-2000
eTools v7	63.53MM	Weather normals from 1981-2010

3.12 Phase 2 conclusions

The results of this study show that, after key engineering assumptions are refined, eTools can provide a reasonably accurate estimate of aggregate advancement savings. The study did not address factors external to the eTools calculator that could cause deviations from savings estimates and whose impacts could be studied, such as:

- Contractor equipment installation processes
- Boiler system commissioning processes
- End user operation and maintenance of boiler systems

eTools is a sophisticated engineering-based estimation calculator that exceeds industry standard practice and generates local knowledge of implementation practices. There are no other boiler savings estimation models that are known to be more accurate, nor any known to be in development. Changing tools for evaluation will introduce additional uncertainty as to the causes of differences in verified vs. claimed savings.

Performance gaps in energy efficiency performance simulation software persist across all kinds in jurisdictions around the world. Despite significant performance gaps found in building energy conservation measures, for both new and retrofit buildings, no jurisdiction has discarded their performance simulation software. EnergyPlus, 3E Plus, Integrated Engineering Software, etc. are all used to provide forecasted savings in buildings even those these are seldom fully realized.

3.12.1 eTools and implementation recommendations

1. eTools advancement projects should not utilize the current 73% thermal efficiency default value, it should utilize site specific values, supported by documentation. If no defensible site-specific values are available the efficiency values identified in this study, 80.1% for space heating and 81.8% for domestic hot-water heating, should be utilized.
2. Site specific documentation verifying any anticipated controls or setpoint changes should be gathered by Enbridge after boiler system commissioning. If documentation verifying control changes are unavailable, then the installed systems should be assumed to utilize the same controls and setpoints as the existing systems.

3. Improve upon the weather normalization method for consumption data through adopting industry standard practices (ASHRAE, IPMVP, etc.) and thoroughly documenting the rationale for any deviations from those standards. Given the upward trend in temperatures, eTools should utilize weather normal values based on the 10 most recent years of data.
4. Investigate potential sources of bias in savings estimates associated with Air Handlers, Lead-lag installations, and combined systems. While the evaluation was not able to test changes to these settings in eTools, the multivariate analysis found that these characteristics were associated with errors in estimated savings.
5. More rigorous data collection for existing and new boiler systems to capture empirical information to refine values for the various eTools' parameters that impact boiler performance, such as:

    a. Impacts of insulation on boiler shell heat losses
    b. Boiler purge frequency and associated heat losses
    c. Hot water load of combined systems
    d. Percentage of load served by lead boilers in lead lag systems

3.12.2 Evaluation recommendations

The recommendation for OEB and EAC's consideration for future eTool commercial boiler evaluations are:

1. Continue using eTools for implementation and evaluation. eTools is a sophisticated engineering-based estimation calculator that exceeds industry standard practice and generates local knowledge of implementation practices. There are no other boiler savings estimation models that are known to be more accurate, nor any known to be in development. Changing tools for evaluation will introduce additional uncertainty as to the causes of differences in verified vs. claimed savings. The use of this modelling software is akin to other building simulation software which contains known performance gaps in energy efficiency measures that persist across all kinds of jurisdictions around the world. Despite these performance gaps, no jurisdiction has discarded their performance simulation software. EnergyPlus, 3E Plus, Integrated Engineering Software, etc. are all used to provide forecasted savings in buildings despite rarely being accurate for an individual building.

    a. eTools advancement projects should not utilize the current 73% thermal efficiency default value, site specific values (supported by documentation) should be utilized. If documented site-specific values are available the efficiency values identified in this study, 80.1% for space heating and 81.8% for domestic hot-water heating, should be utilized by implementers and evaluators.
    b. Site specific documentation verifying any anticipated controls or setpoint changes should be gathered by Enbridge after boiler system commissioning. If documentation verifying controls changes are unavailable, then the installed systems should be assumed to utilize the same controls and setpoints as the existing systems.
    c. Version e8-00 of eTools was the latest version reviewed during this study and should be utilized by the evaluation team to assess any projects using eTools e8-00 or earlier.
    d. Projects using a version of eTools more modern than e8-00 should use the modern version of eTools in evaluation. A "between version" calibration factor that takes the savings from version e8-00 relative to the new version should be employed to ensure that the changes from one version to another are accounted for without restricting the evaluation to using only version e8-00 prior to re-calibrating the billing analysis (see below in point 5). This calibration can be calculated using the sample plus the backup sample of projects in the evaluation (those that the evaluation requests files for as part of the typical evaluation process).

2. Future evaluations of eTools commercial boiler projects should continue in a manner consistent with Custom Project Savings Verification (CPSV) evaluations from 2015-2018 while updating the model to eTools version e8-00 or more modern. This means updating inputs to eTools based on site-specific data collected through evaluation activities.

3. After implementation of list items 1.a. and 1.b., the recommended realization rate from this study (84%), can be applied to evaluate aggregate eTools boiler gross savings. This recommended realization rate uses that described in 1a) above as well as incorporates the findings from EGI's study of non-participant natural gas consumption trends (APPENDIX A), explained in Section 3.11.
4. A correction factor for the double counting between evaluated gross savings and billing analysis should be utilized. As part of this study, it was found that based on past projects, the adjustment factor was 0.97. An alternative to using this factor is to re-estimate the correction factor based on the sample of projects evaluated in CPSV to apply to that year's CPSV results. The determination of which to use will be made by the evaluation team with input from the EAC and OEB. The primary factor in the decision will be the sample size of boilers evaluated.
5. eTools should be periodically calibrated via billing analysis to improve the accuracy of aggregate savings estimates. The precise cadence/timing of the calibration cannot be defined at this time in part because evaluation budget consideration necessarily have a role in determining the timing. Re-calibrating the billing analysis will be more about changes in use of eTools (defaults, assumptions and data entry choices) and less about the changes in the underlying calculations, which will be captured in the suggested "between version" calibration factor in 1d.
   The OEB and EAC should consider the following key factors when determining whether a billing analysis calibration should be conducted:

   a. Whether EGI's internal user guidelines for eTools have changed in a manner that materially impacts savings estimates produced. As informed by Enbridge's analysis of the impact of its user guideline changes to eTools. Materially in this case would be a change that is expected to change boiler savings by more than 5% in aggregate for boilers in the program. Note that 5% is a starting point to inform the EAC when it is time to start planning the next study.
   b. If newer eTools versions are found to produce savings materially different from the versions evaluated in this study As informed by Enbridge's analysis of the impact of its updates to eTools and/or the calibration factors estimated in 1d above. If calibration factors in 1d exceed 10% it is of higher priority to conduct another calibration. 10% is a starting point, given that 1d is likely based on a relatively small sample, it is prudent to use a higher threshold than 5a. If there is sufficient post-case heating data (minimum of two heating seasons) for the population of sites to be included in the billing analysis
   c. If there is sufficient post-case heating data (minimum of two heating seasons) for the population of sites to be included in the billing analysis

3.13 Additional thoughts

This section covers alternative pathways forward, or potential areas of further inquiry, that are not recommended but were considered as options.

3.13.1 Alternatives to using eTools

The only reasonable alternative to using eTools for ex ante estimates and correcting the models with ex post information, from CPSV evaluation or regularly conducted billing analysis, is to change the program structure to a pay-for-performance program. DNV has yet to come across a modelling software that attempts to model savings from boiler ECMs as granularly as eTools. Most other efficiency programs utilize rudimentary prescriptive algorithms to determine boilers savings that would likely have worse RRs than eTools if they were checked against billing analysis results. Additionally, performance gaps in energy efficiency measures persist across all kinds in jurisdictions around the world. Despite significant performance gaps found in building energy conservation measures, for both new and retrofit buildings, no jurisdiction has discarded their performance simulation software (EnergyPlus, 3E Plus, Integrated Engineering Software, etc.) are all used to provide

forecasted savings in buildings even those that are seldom fully realized. If eTools is discarded then the program structure will likely need to be changed to a pay-for-performance program, there will be new risks because:

- Only billing analysis (which has its complexities and risks) could be utilized for the evaluation of such a program.
- Quality and consistency of pre- and post- project documentation could diminish, leading to a lack of transparency into the ECMs that were implemented, and increasing the difficulty of interpreting and contextualizing the billing analysis results.
- Identification of potential NREs would become more important, and the methods to identify them (described in Section 3.13) introduce their own complexities and risk.
- Program participation could suffer due to reduced or eliminated upfront incentives.
- Differences in contractor equipment installation processes
- Differences in boiler system commissioning processes
- Differences in end user operation and maintenance of boiler systems

3.13.2 Control group study

A control group study was initially proposed to attempt to quantify possible population wide consumption trends or NREs (discussed in earlier parts of this report) that may be conflated with and included in the billing analysis estimates. EGI contracted with another evaluator, Demand Side Analytics, to perform a control group study similar to the study we would provide. The results from that analysis were consistent with the methodology DNV would employ and provided evidence of a trend of minor increases in consumption that would lead to a slight downward bias on billing analysis savings estimates. Having reviewed the DSA study carefully, DNV does not believe further control group study is justified and, we have incorporated those estimates into our discussion to demonstrate that they have limited effect on the overall findings of the analysis.

3.13.3 Customer NRE surveys

Investigation of NREs based on customer reported information to be utilized in adjusting eTools project savings is typically reserved for CPSV evaluations. However, there is potential value to the qualitative information that could be gained in a focused survey of the sites sampled for Phase1 and Phase 2 of this study. There are a few areas of concern to consider prior to pursuing a customer survey to learn about potential NREs:

1. Many of the projects were completed over 5 years ago, before 2017. Getting accurate information about events that far back will require a carefully crafted survey instrument with stakeholder input.
2. The desired use case for qualitative information acquired about customers' NREs is unclear and will have to be discussed amongst stakeholders to inform the design of a robust survey instrument.
3. Even if all the points above are addressed and agreed upon by stakeholders, the surveys could still result in low response rates or insufficient information. As a point of comparison, the discovery of potential NREs in the population of sites that implemented boiler projects in CPSV EY2019 was ≤11%.
4. As there continues to be pressure from all levels of government and the public for customers to reduce their fossil fuel use, data on NREs from past years may become increasingly out of date and misleading.

These risks should be carefully considered and properly mitigated in the scoping of customer surveys targeted at identifying NREs.

DNV

APPENDIX A. ENBRIDGE NON-PARTICIPANT BILLING ANALYSIS

Demand Side Analytics
DATA DRIVEN RESEARCH AND INSIGHTS

Preliminary Report

Non-Participant Billing Analysis

Prepared for: Enbridge Gas Inc.
By: Demand Side Analytics
February 2022

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.

Demand Side Analytics
DATA DRIVEN RESEARCH AND INSIGHTS

Preliminary Report

Non-Participant Billing Analysis

Prepared for: Enbridge Gas Inc.
By: Demand Side Analytics
February 2022

1 BACKGROUND

Enbridge Gas Inc. (EGI) has retained Demand Side Analytics (DSA) to provide technical support related to a study performed by DNV on behalf of the Ontario Energy Board (OEB). That study utilizes a pre-post analysis of natural gas billing records to estimate energy savings from energy-efficiency projects incentivized by Enbridge. One of the key outputs of that study is a comparison of the billing analysis results to savings estimates generated by Enbridge's eTools package.

Based on initial regression outputs, DNV suggests that eTools estimates may overstate natural gas savings. For the DNV estimation sample, the sum of the site-level eTools savings is 15.3 million m^3/year, while the sum of DNV's site-level regressions totals 10.6 million m^3/year in fuel savings. This roughly equates to a 70% realization rate. Additionally, it is important to note the estimated pre-period consumption of the two methods. Table 1 shows both outputs along with the aggregate percent savings the two methods return for this group of program participants.

Table 1: Evaluated eTools and DNV Metrics

	eTools	DNV
Estimated Pre-Period Consumption (m^3/year)	88,756,114	92,813,575
Estimated Savings (m^3/year)	15,254,269	10,610,014
Estimated Percent Savings	**17.19%**	**11.43%**

The variance in results across these two methods merits further investigation regarding the technical inputs and assumptions. We understand that DNV and the OEB are currently working with EGI on a "Phase 2" analysis that should help shed light on the key drivers. Given the implications of these preliminary findings, EGI is interested in understanding the accuracy and precision of billing analysis as a method for quantifying natural gas savings. In this analysis, DSA mirrors the DNV regression analysis for a large sample of EGI customers that did not complete an energy–efficiency project. For these non-participants, the correct savings value is zero m^3/year and any estimate above or below zero is error. Analyzing the distribution of errors amongst non-participants provides useful context for the participant billing analysis. This analysis also provides insights into how sensitive the billing analysis findings are to certain modeling choices made by the DNV team.

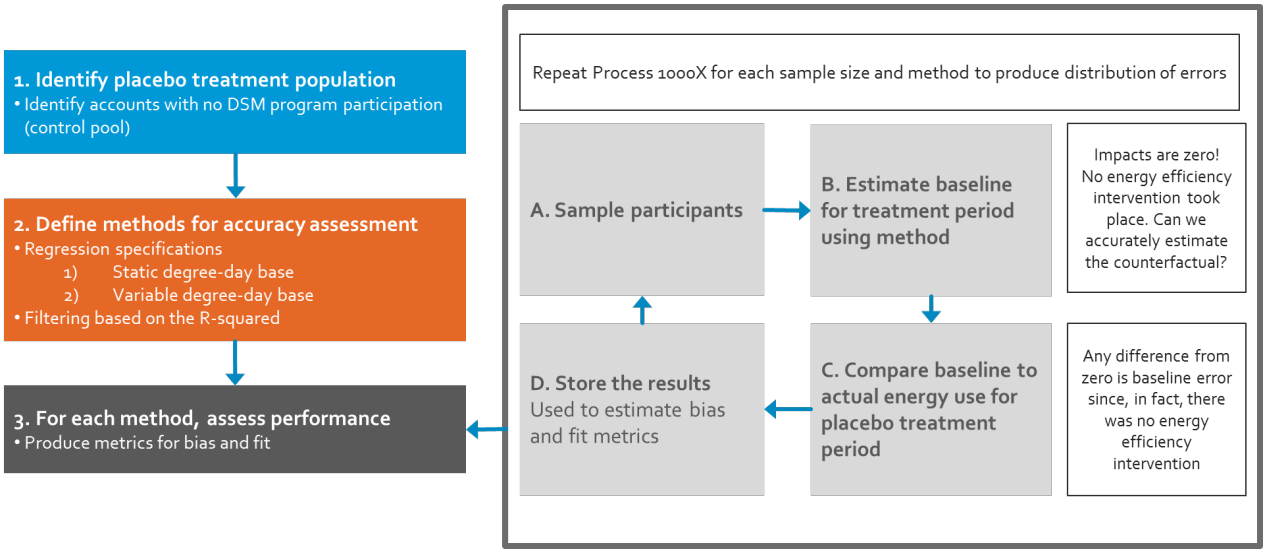
2 METHODS

2.1 STUDY DESIGN

The primary challenge with estimating energy savings is the need to accurately detect changes in energy consumption due to demand-side management (DSM) programs while systematically eliminating plausible alternative explanation for those changes, including random chance and non-routine events. To quantify energy savings, it is necessary to estimate what energy consumption would have been in the absence of program intervention – the counterfactual or baseline.

To assess accuracy, one needs to know the correct values. When we know the correct answers, it is possible to determine if each alternative method correctly measures energy use and, if not, by how much it deviates from the known values. Figure 1 summarizes the approach that is used to assess the accuracy and precision of different methods. The approach is effectively a competition, where the answer key is known, and different methods are tested repeatedly, to identify the methods that are unbiased and accurate.

Figure 1: General Approach for Accuracy Assessment (Repeated 1000X)



We assess accuracy by applying placebo treatment periods to accounts that, in fact, did not participate in DSM programs during the period analyzed. Because there was no participation in DSM programs, any deviation between the counterfactual and actual gas consumption is due to error. We repeat the process of selecting 500 non-participants 1,000 times – a procedure known as bootstrapping – to construct the distribution of errors.

2.2 IDENTIFY PLACEBO TREATMENT POPULATION

Before the accuracy assessment can be implemented, it is necessary to identify the placebo treatment population. For this analysis, we use pseudo-participants drawn from a pool of accounts with at least

five years of consecutive billing history but no participation in EGI DSM programs from 2012 to 2019. Critically, they must have an extended period of billing history without DSM participation, which allows us to conduct the accuracy assessment.

Due to the nature of the bi-monthly reads, we first begin cleaning the non-participant data by aggregating estimated reads with actual reads. From this point, we randomly assign non-participants an "installation" date, which is defined by a randomly generated month and year between January 2014 and December 2017. After assigning an installation date to each non-participant, we keep the two years of "pre-installation" data and the two years of "post-installation" data.

Following this initial data cleaning, we implement the data sufficiency and data coverage requirements that DNV used in their site selection. The data sufficiency requirement states that sites with fewer than "10 total data points in either the pre or post period" be removed from the analysis dataset. Additionally, the data coverage requirement states that "sites without 80% of the days in the pre or post period" be removed from the analysis dataset. Table 2 demonstrates how this limited our initial pool of non-participants from 23,251 to 17,220.

Table 2: Site Selection

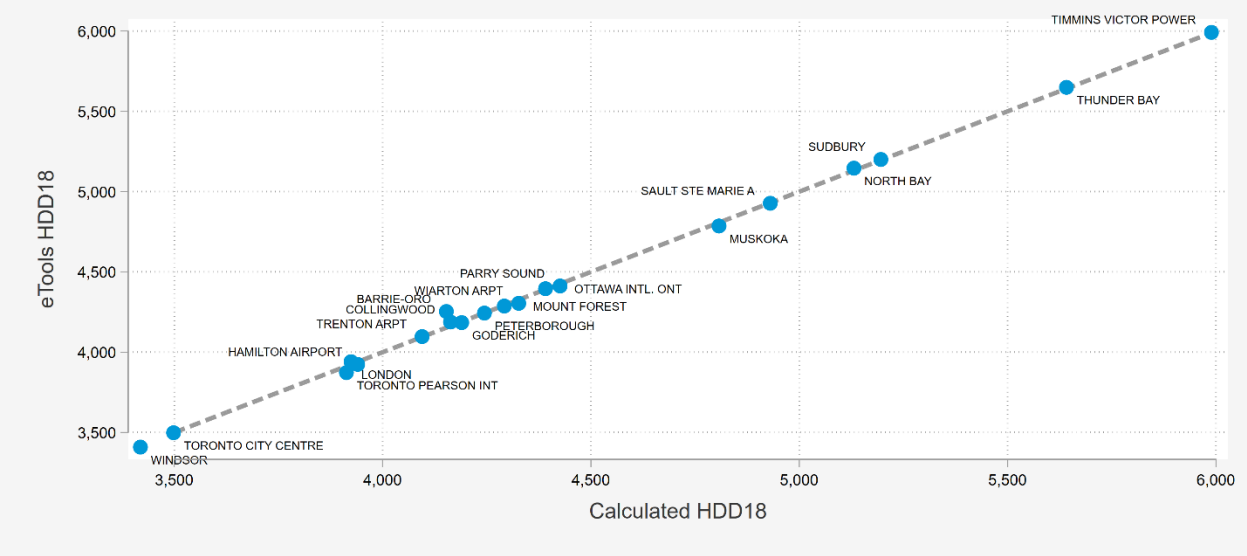
Elimination Step	Sites Included
Initial Dataset	23,251
Removing those with fewer than 10 points in either the pre or post period	19,392
Removing those with less than 80% of days present in either the pre or post period	17,220

Finally, all remaining non-participants were matched to the closest Ontario weather station based on their postal code. This same weather station is used when assessing the normalized consumption.

2.3 WEATHER NORMALS

In a pre-post billing analysis, regression models are fitted using actual consumption and weather conditions. In order to control for variation in weather, we use the regression coefficients to predict consumption under fixed, or "normal", conditions. We predict weather-normalized pre-retrofit consumption and weather-normalized post-retrofit. The difference between these two predictions is the weather-normalized savings estimate. Our selection of weather normals mirrors our understanding of DNV's approach, where a single weather year was selected for each Ontario weather station that most closely resembles the heating degree days reported by eTools at an 18°C base. Figure 2 shows how our weather normals compare to the eTools weather normals at an 18°C base. The grey line indicates what would be a one-to-one ratio between the two.

Figure 2: Comparison of Weather Normals at 18 ° C Base



2.4 REGRESSION SPECIFICATIONS

For each non-participant, we run a set of degree-day regression models, where we model the daily gas consumption as a function of the average heating degree days within the billing period. In this model, observations are weighted based on the number of days included in the billing period, which mirrors DNV's weighting scheme. Additionally, the pre-period and post-period are modeled separately. The resulting constant and heating degree day coefficient of these regressions are then applied to the weather normals for the specified weather station at the specified degree-day base. This modelling produces two normalized annual consumption estimates for each non-participant, one based on the pre-period and one based on the post-period.

The regression model addressed above mirrors the DNV approach to weather normalized savings calculations. This general regression model is then applied to the four specifications defined below:

1) Fixed 15 ° C base
2) Fixed 18 ° C base
3) Variable base dependent on the r-squared in the pre-period (10°C – 20°C)
4) Variable base for both the pre-period and the post-period dependent on the respective r-squared (10°C – 20°C)
    - R-Squared Cutoff (None, 0.5, and 0.8)

We believe that the variable base for both the pre-period and the post-period is the specification that DNV implemented in its evaluation. We use the other tests to showcase how estimates may differ based on the specification implemented.

2.5 PERFORMANCE METRICS

Across the 17,220 non-participants, each regression specification is applied and the normalized pre-period consumption, error, and percent error are stored. We are then able to draw samples of 500 non-participants and store the aggregate normalized pre-period consumption, aggregate error, and aggregate percent error for each of the 1,000 iterations.

Table 3: Performance Metrics

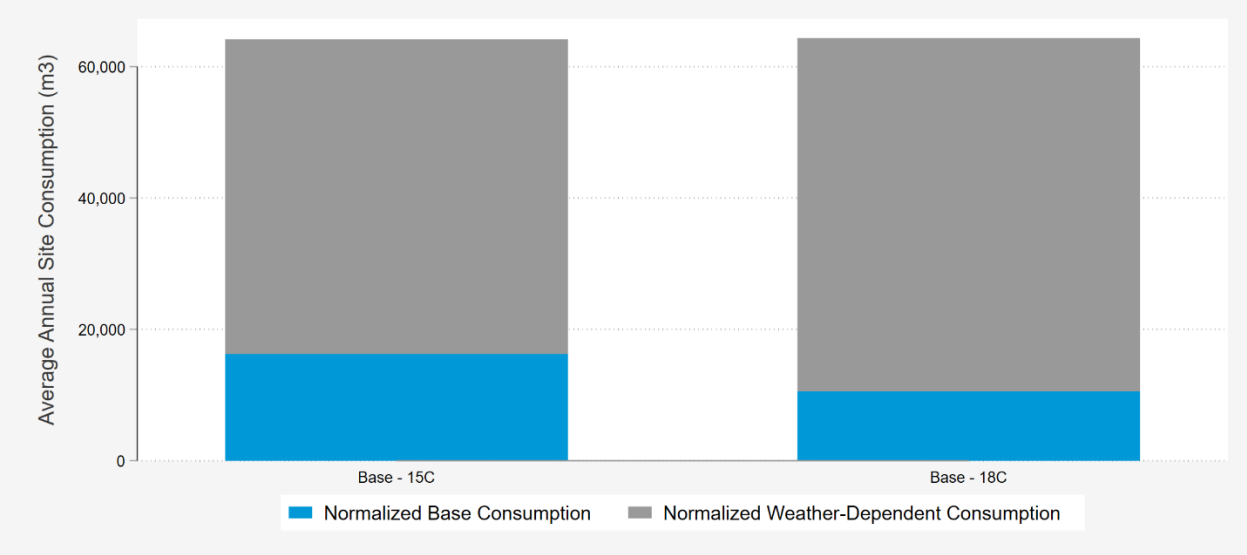
Metric	Description	Units
Error	Difference between the normalized pre-period and the normalized post-period consumption for each non-participant.	m^3/year
Aggregate Error	Summation of the error across the sample of 500 customers.	m^3/year
Percent Error	Error over the normalized pre-period consumption for each non-participant.	%
Aggregate Percent Error	Aggregate error over the summation of the normalized pre-period consumption across the sample of 500 customers.	%

3 PRELIMINARY RESULTS

To frame our tests of the various degree-day bases, it is important to understand how these different bases compare. Using a heating degree-day model places consumption into two bins, either the consumption is dependent on the weather or it is not. Weather-dependent consumption is explained by the slope of the regression and base consumption is captured by the model intercept. Depending on the level of the degree day base implemented, we see more or less consumption assigned to the weather-dependent bin.

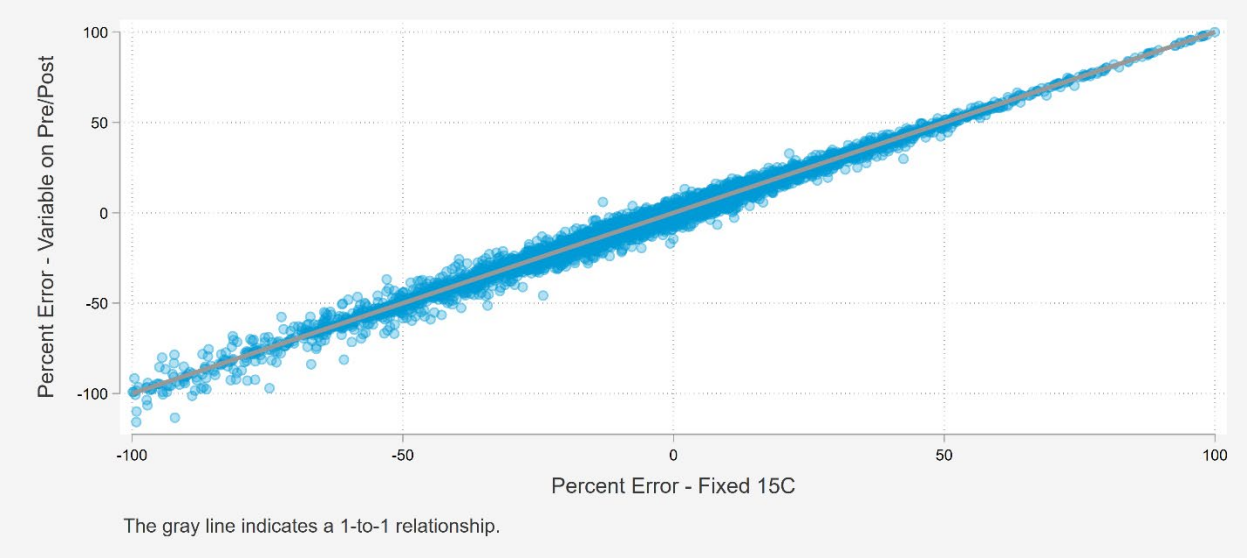
Since all tests are run and stored for each non-participant, we are able to compare the weather dependency of the 15°C base and the 18°C base. Across all non-participants, Figure 3 shows, that on average, a higher base temperature partitions more consumption into the weather-dependent bin and less into the base.

Figure 3: Comparing Weather Dependent Consumption of 15 °C and 18°C



With this understanding of how the degree-day base impacts the modelling of normalized consumption, the more fundamental question becomes how do these bases impact the error of individual non-participants. To visualize this, Figure 4 plots the percent error of the variable base on the pre and post-period against the percent error of the fixed 15°C base for all 17,000 non-participants. The scatter shows the relationship between the variable base and the fixed base, with the gray line indicating that the two errors are equivalent. While some non-participants have a bit of deviation, it does not appear to be biased in one direction, which leads us to conclude that the various models do not produce materially different results.

Figure 4: Regression Specification Percent Error Comparison



As we move from the full non-participant population to drawing samples, we want to ensure similarity between our samples and the population analyzed by DNV. In drawing our samples, we stratify by annual consumption bins. This is done to ensure that our samples are roughly representative of the size of the participant population.

To understand the distribution of our data, we use boxplots. There are four important takeaways from these boxplots:

1.) **Median**. The median marks the mid-point of the data and can be identified by the horizontal, white line.

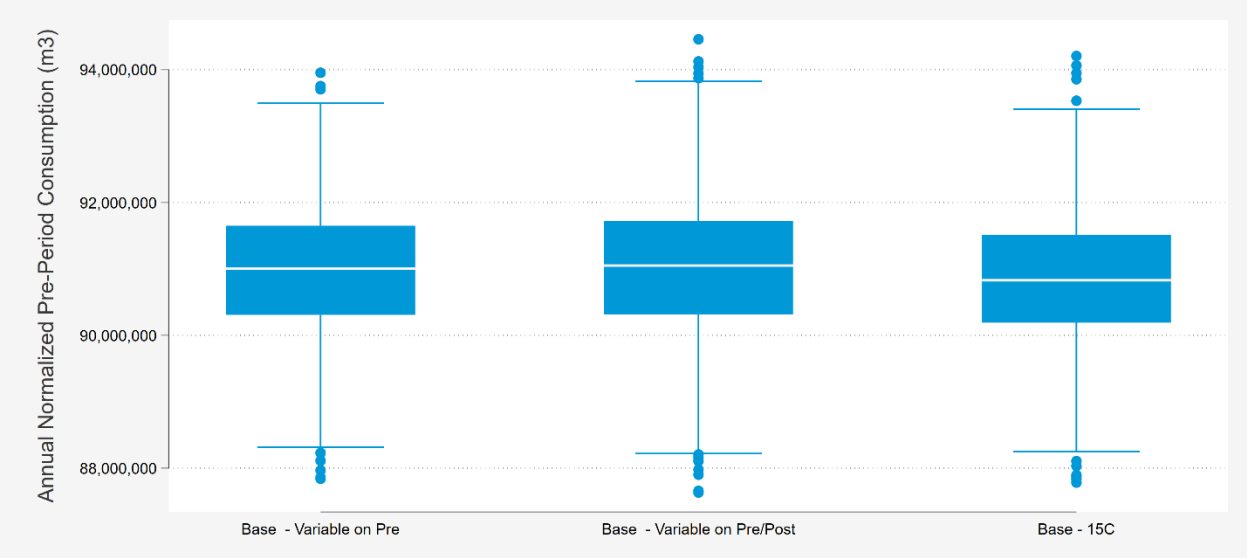
2.) **Middle 50%**. The blue box encompasses the middle 50% of the data (e.g. from the 25th percentile to the 75th percentile)

3.) **Upper/Lower 25%**. The whiskers, or the lines extending from the box, have a length of 1.5 times the distance from the 25th percentile to the 75th percentile.

4.) **Outliers**. Outliers are represented by dots outside of the whiskers.

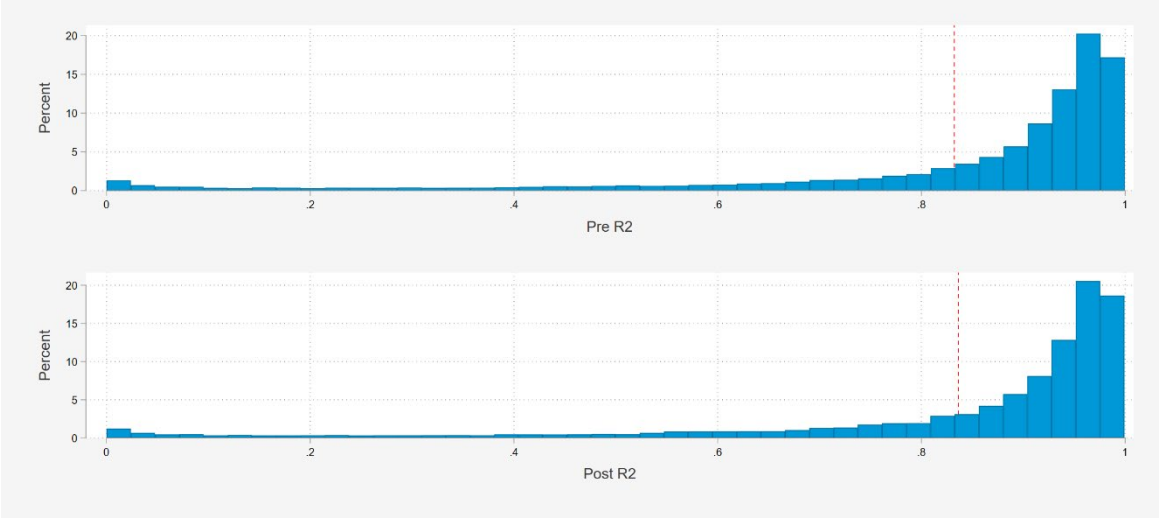
Given that eTools estimates a normalized pre-period consumption of 88.8 million m^3/year and DNV estimates a consumption of 92.8 million m^3/year, Figure 5 displays our distribution of the normalized pre-period consumption. About 50% of our iterations have a normalized pre-period consumption between 91.0 and 91.7 million m^3/year.

Figure 5: Distribution of Normalized Pre-Period Consumption



With the knowledge that our pre-period consumption is similar to DNV and the base-type does not have a material impact on the error, we hone in on the variable base for both the pre-period and the post-period to mirror our understanding of the DNV methodology. Using this method, we produce an average R-squared of 0.83, as seen in Figure 6.

Figure 6: R-Squared Distribution of Variable Pre/Post Base



Although this model produces a fairly high average R-squared, we test R-squared cutoffs to mirror DNV. In the original study, a 0.5 cutoff was used for participants that installed a boiler for water heating and a 0.8 cutoff was used for participants that installed a boiler for space heating. As our non-participants did not install either of these, in Figure 7, we test the model without a cutoff, with a cutoff of 0.5, and with a cutoff of 0.8. These distributions highlight how the use of an R-squared cutoff improves both the accuracy and precision of the results.

Figure 7: Distribution of Aggregate Error with R-Squared Cutoffs

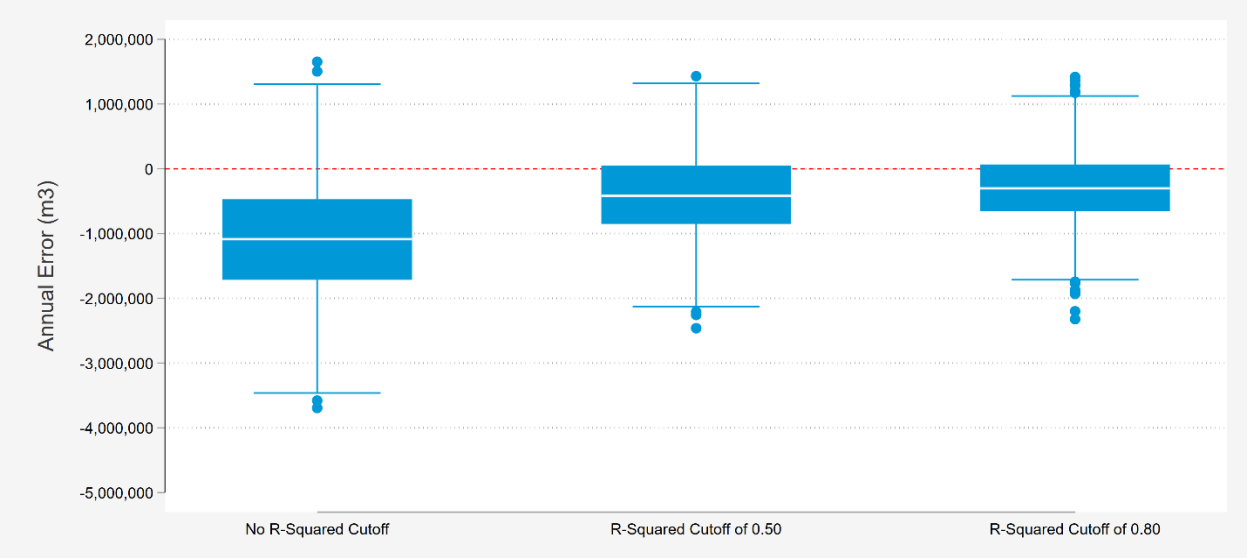


Table 4 displays the metrics for the distribution in Figure 7. Overall, the central tendency is a modest increase in consumption for the control customers in the post-installation period (0.3% to 1.2%), which would indicate that the DNV pre-post model tends to understates the true savings. Inclusion of a control group in the modelling approach would likely correct this bias. However, the central tendency across hundreds of runs hides the variability in the results. Individual runs can lead to swings in aggregate savings between 1 million and 1.5 million. This is important because the participant analysis is only completed once and DNV does not have the luxury of hundreds of iterations.

Table 4: Performance Metrics for R-Squared Cutoff

R-squared Cutoff	Aggregate Error (m^3/year) [90% Confidence Interval]	Percent Error
--	-1,086,437 ± 1,467,972	-1.20%
0.5	-399,971 ± 1,049,508	-0.44%
0.8	-303,715 ± 914,732	-0.33%

Exhibit I.SEC.1b Table 1. EGD Rate Zone 2021 cumulative cubic meter savings recalculated with the eTools study adjustment factor applied

Scorecard	Offering		2021 Verified Net Cumulative Gas Savings as filed (m3)	2021 Verified Net Cumulative Gas Savings (m3) as filed broken out by eTools boiler or all other		eTools boiler study adjustment	2021 Net Cumulative Gas Savings after application of eTools boiler study adjustment	Sums for scorecards	Difference in net CCM
Resource Acquisition	Large Volume Customers	Large Commercial & Industrial Custom Large Commercial & Industrial Prescriptive Large Commercial & Industrial Direct Install Run it Right Comprehensive Energy Management Energy Leaders	430,134,894	eTools boiler net CCM (m3):	114,263,143	0.84	95,981,040	411,852,791	-18,282,103
				All other net CCM (m3):	315,871,751	NA	315,871,751		
	Small Volume Customers	Small Commercial & Industrial Custom Small Commercial & Industrial Prescriptive Small Commercial & Industrial Direct Install Run it Right Home Efficiency Rebate Adaptive thermostats Energy Leaders	317,200,551	eTools boiler net CCM (m3):	11,617,396	0.84	9,758,612	315,341,767	-1,858,783
				All other net CCM (m3):	305,583,155	NA	305,583,155		
Low Income	Winterproofing	Residential Part 9	26,443,935	eTools boiler net CCM (m3):	0	0.84	0	26,443,935	0
				All other net CCM (m3):	26,443,935	NA	26,443,935		
	Multi-Residential	Commercial Part 3	88,304,418	eTools boiler net CCM (m3):	35,777,185	0.84	30,052,836	82,580,068	-5,724,350
				All other net CCM (m3):	52,527,233	NA	52,527,233		
		Total	**862,083,797**		**862,083,797**		**836,218,561**	**836,218,561**	**-25,865,236**

Exhibit I.SEC.1b Table 2. Union Rate Zones 2021 cumulative cubic meter savings recalculated with the eTools study adjustment factor applied

Scorecard	Offering	2021 Verified Net Cumulative Gas Savings as filed (m3)	2021 Verified Net Cumulative Gas Savings (m3) as filed broken out by eTools boiler or all other		eTools boiler study adjustment	2021 Net Cumulative Gas Savings after application of eTools boiler study adjustment	Sums for scorecards	Difference in net CCM
Resource Acquisition	Home Efficiency Rebate Commercial & Industrial Prescriptive Commercial & Industrial Direct Install Commercial & Industrial Custom Adaptive Thermostats	635,084,367	eTools boiler net CCM (m3):	21,161,759	0.84	17,775,878	631,698,485	-3,385,881
			All other net CCM (m3):	613,922,608	NA	613,922,608		
Low Income	Home Weatherization Furnace End-of-Life Indigenous	45,903,844	eTools boiler net CCM (m3):	0	0.84	0	45,903,844	0
			All other net CCM (m3):	45,903,844	NA	45,903,844		
	Social and Assisted Multi-family	9,535,480	eTools boiler net CCM (m3):	2,539,832	0.84	2,133,459	9,129,107	-406,373
			All other net CCM (m3):	6,995,648	NA	6,995,648		
	Market Rate Multi-family	8,307,799	eTools boiler net CCM (m3):	4,731,880	0.84	3,974,779	7,550,698	-757,101
			All other net CCM (m3):	3,575,919	NA	3,575,919		
Large Volume Rate T2/ Rate 100	Large Volume	141,733,709	eTools boiler net CCM (m3):	0	0.84	0	141,733,709	0
			All other net CCM (m3):	141,733,709	NA	141,733,709		
Performance-based	Strategic Energy Management	4,850,000	eTools boiler net CCM (m3):	0	0.84	0	NA	0
			All other net CCM (m3):	4,850,000	NA	4,850,000		
	Total	**845,415,199**		**845,415,199**		**840,865,843**	**836,015,843**	**-4,549,355**

Exhibit I.SEC.1c Table 3. EGD Rate Zone recalculation of 2021 scorecard achievement and shareholder incentive with eTools adjustment factor applied

				Metric Target Levels				2021 Scorecard Results							
Scorecard	**Offering**		**Metric**	**Lower Band**	**Target**	**Upper Band**	**Weight**	**Achievement that reflects eTools study factor**	**% of Metric Achieved**	**Weighted % of Scorecard Achieved**	**Total**	**Total DSM Incentive that reflects eTools study factor**	**% of Max Incentive**	**Total DSM Incentive that matches claim**	**Difference**
Resource Acquisition	Large Volume Customers	Large Commercial & Industrial Custom Large Commercial & Industrial Prescriptive Large Commercial & Industrial Direct Install Run it Right Comprehensive Energy Management Energy Leaders	Cumulative Natural Gas Savings (m3)	381,230,912	508,307,882	762,461,823	40%	411,852,791	81.0%	32%	115.63%	$4,120,515	59%	$4,267,746	-$147,232
	Small Volume Customers	Small Commercial & Industrial Custom Small Commercial & Industrial Prescriptive Small Commercial & Industrial Direct Install Run it Right Home Efficiency Rebate Adaptive thermostats Energy Leaders	Cumulative Natural Gas Savings (m3)	179,362,258	239,149,677	358,724,516	40%	315,341,767	131.9%	53%					
	Residential Deep Savings		Participants	7,541	10,054	15,081	20%	15,321	152.4%	30%					
Low Income	Winterproofing	Residential Part 9	Cumulative Natural Gas Savings (m3)	21,577,192	28,769,589	43,154,383	45%	26,443,935	91.9%	41%	91.38%	$593,335	26%	$693,807	-$100,472
	Multi-Residential	Commercial Part 3	Cumulative Natural Gas Savings (m3)	69,641,327	92,855,103	139,282,654	45%	82,580,068	88.9%	40%					
	Affordable Housing New Construction		Participants	10	13	19	10%	13	100.0%	10%					
Market Transformation	Residential Savings by Design		Builders Enrolled	29	39	59	10%	24	62.1%	6%	37.31%	$0	0%	$0	$0
			Homes Built	2,329	3,105	4,658	15%	2,514	81.0%	12%					
	Commercial Savings by Design		New Developments	28	37	56	25%	17	45.5%	11%					
	School Energy Competition		Schools	44	58	87	10%	0	0.0%	0%					
	Run it Right		Participants	87	116	175	20%	36	31.0%	6%					
	Comprehensive Energy Management		Participants	22	29	44	20%	2	6.8%	1%					
										Total		**$4,713,849**		**$4,961,553**	**-$247,704**

Exhibit I.SEC.1c Table 4. Union Rate Zones recalculation of 2021 scorecard achievement and shareholder incentive with eTools adjustment factor applied

			Metric Target Levels				2021 Scorecard Results							
Scorecard	**Offering**	**Metrics**	**Lower Band**	**Target**	**Upper Band**	**Weight**	**Achievement that reflects eTools study factor**	**% of Metric Achieved**	**Weighted % of Scorecard Achieved**	**Total**	**Total DSM Incentive that reflects eTools study factor**	**% of Max Incentive**	**Total DSM Incentive that matches claim**	**Difference**
Resource Acquisition	Home Efficiency Rebate Commercial & Industrial Prescriptive Commercial & Industrial Direct Install Commercial & Industrial Custom Adaptive Thermostats	Cumulative Natural Gas Savings (m3)	576,545,784	768,727,712	1,153,091,568	75%	631,698,485	82.2%	61.6%	82%	$772,234	12%	$806,921	**-$34,687**
	Home Efficiency Rebate	Participants (Homes)	4,553	6,070	9,105	25%	5,032	82.9%	20.7%					
Low Income	Home Weatherization Furnace End-of-Life Indigenous	Cumulative Natural Gas Savings (m3)	39,563,598	52,751,464	79,127,196	60%	45,903,844	87.0%	52.2%	74%	$0	0%	$0	**$0**
	Multi-family	Social and Assisted Multi-Family Cumulative Natural Gas Savings (m3)	13,085,633	17,447,511	26,171,267	35%	9,129,107	52.3%	18.3%					
		Market Rate Multi-Family Cumulative Natural Gas Savings (m3)	8,962,524	11,950,032	17,925,049	5%	7,550,698	63.2%	3.2%					
Market Transformation	Optimum Home	Percentage of Homes Built (>15% above OBC 2017) by Participating Builders	45.7%	60.9%	91.3%	50%	73.1%	120.0%	60.0%	108%	$200,960	50%	$200,960	**$0**
	Commercial Savings by Design	New Developments Enrolled by Participating Builders	19	25	38	50%	24	95.8%	47.9%					
Performance-Based	RunSmart	Participants	52	69	104	10%	0	0	0	23%	$0	0%	$0	**$0**
		Savings (%)	0.3%	0.4%	0.7%	40%	0.00%	0.0%	0.0%					
	Strategic Energy Management (SEM)	Savings (%)	5.9%	7.9%	11.8%	50%	3.6%	45.1%	22.6%					
Large Volume Rate T2/Rate 100	Large Volume Program for T2/R100 Customers	Cumulative Natural Gas Savings (m3)	87,077,474	116,103,299	174,154,948	100%	141,733,709	122.1%	122.1%	122%	$461,621	66%	$461,621	**$0**
									Total		**$1,434,816**		**$1,469,503**	**-$34,687**

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Reference:

Exhibit A, Tab 4, Schedule 1, Page 24 table 3.14

Question(s):

Please provide the number of Low-Income customers in the EGD Rate Zones.

Response:

It is Enbridge Gas's opinion that this question is out of scope for the Application for the Disposition of the 2021 Demand Side Management Deferral and Variance Accounts. In its Procedural Order No. 1, the OEB notes:

> "The current proceeding will consider Enbridge Gas' request to clear the 2021 balances in its three DSM deferral and variance accounts based on an existing OEB-approved framework. It is the last year of the current DSM framework. The intention of the current proceeding is not to develop a new DSM framework or policy, or modify the existing OEB-approved policy. No significant policy issues will be considered in this proceeding." [1]

Further, Enbridge Gas does not have an absolute way of identifying Low Income customers in the source system and there are many different characterizations to identify Low Income status. However, in an effort to be responsive, Enbridge Gas can provide the following information.

Statistics Canada[2] identified the prevalence of low income (Low-income measure, before-tax or LIM-BT)[3] to be 13.0% for Ontario in 2021. Applying this percentage to

[1] EB-2023-0062, Application for the disposition of 2021 Demand Side Management Deferral and Variance Accounts, Procedural Order No. 1, June 9, 2023, p.2.

[2] Statistics Canada. Table 98-10-0100-01 Low-income status by age, census family characteristics and household type : Canada, provinces and territories, census metropolitan areas and census agglomerations with parts, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810010001&pickMembers%5B0%5D=1.56&pickMembers%5B1%5D=2.1

[3] This designation does not necessarily align with Enbridge Gas's Low-Income program eligibility requirements, but is used for the purposes of this interrogatory response.

Table 3.14[4] from the 2021 Annual Report would imply that there are approximately 271,000 residential customers in the EGD rate zone that are low income. Enbridge Gas would caution that this value is only an estimate. Statistic Canada's LIM-BT percentage includes all individuals across Ontario, living in single-family and multi-residential dwellings. It is not necessarily reflective of the proportion of customers who are low-income in the EGD rate zone.

[4] Exhibit A, Tab 4, Schedule 1, p. 24.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Reference:

Exhibit A, Tab 4, Schedule 1, Page 33 Table 4.14

Question(s):

Please provide the number of Low-Income customers in the Union Rate Zones.

Response:

It is Enbridge Gas's opinion that this question is out of scope for the Application for the Disposition of the 2021 Demand Side Management Deferral and Variance Accounts. In its Procedural Order No.1 the OEB notes:

> "The current proceeding will consider Enbridge Gas' request to clear the 2021 balances in its three DSM deferral and variance accounts based on an existing OEB-approved framework. It is the last year of the current DSM framework. The intention of the current proceeding is not to develop a new DSM framework or policy, or modify the existing OEB-approved policy. No significant policy issues will be considered in this proceeding." [1]

Further, Enbridge Gas does not have an absolute way of identifying Low Income customers in the source system and there are many different characterizations to identify Low Income status. However, in an effort to be responsive, Enbridge Gas can provide the following information.

Statistics Canada[2] identified the prevalence of low income (Low-income measure, before-tax or LIM-BT)[3] to be 13.0% for Ontario in 2021. Applying this percentage to Table 4.14[4] from the 2021 Annual Report would imply that there are approximately

[1] EB-2023-0062, Application for the disposition of 2021 Demand Side Management Deferral and Variance Accounts, Procedural Order No. 1, June 9, 2023, p. 2.
[2] Statistics Canada. Table 98-10-0100-01 Low-income status by age, census family characteristics and household type : Canada, provinces and territories, census metropolitan areas and census agglomerations with parts, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810010001&pickMembers%5B0%5D=1.56&pickMembers%5B1%5D=2.1
[3] This designation does not necessarily align with Enbridge Gas's Low-Income program eligibility requirements, but is used for the purposes of this interrogatory response.
[4] Exhibit A, Tab 4, Schedule 1, p.33

184,000 residential customers in the Union rate zones that are low income. Enbridge Gas would caution that this value is only an estimate. Statistic Canada's LIM-BT percentage includes all individuals across Ontario, living in single-family and multi-residential dwellings. It is not necessarily reflective of the proportion of customers who are low-income in the Union rate zones.

ENBRIDGE GAS INC.

Answer to Interrogatory from
Vulnerable Energy Consumers Coalition (VECC)

Interrogatory

Reference:

Exhibit A, Tab 4, Schedule 1, Page 48

Question(s):

The evidence states “During the 2021 Covid shutdown of the program, marketing initiatives continued, unlike 2020. While some initiatives such as the HWP mobile truck was discontinued, various new tactics were added and some previous tactics were expanded.”

Please explain why the HWP mobile truck was discontinued and discuss the impact on the Home Winterproofing Program.

Response:

The HWP (Home Winterproofing Program) mobile truck was discontinued in 2021 as in person events were banned by the Province of Ontario.

The HWP truck ran in 2020 for five months (February to March 2020 and August to October 2020), covered 12 events in total, provided over 30,000 marketing pieces, garnered over 50,000 views, over 5,000 clicks, and 161 users were able to be tracked/linked to the online application form to apply to the program as a result of the mobile truck. This was a great educational and awareness tactic but did not produce the expected results for lead generation or cost per conversion.

A portion of the funds from discontinuing the HWP mobile truck was utilized to increase tactics such as the community newspaper presence with articles and application forms, and also for a media buy including print, radio, television, and web for the month of October. The change in tactic increased results in education, awareness, lead generation and cost per conversion results.