ENBRIDGE

Asha Patel
Technical Manager, Regulatory Applications
Regulatory Affairs

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

VIA RESS and EMAIL

April 19, 2022

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

Dear Ms. Marconi:

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

In accordance with the OEB's Procedural Order #6 enclosed please find Enbridge Gas's responses to the undertakings from the hearing held from March 28 to April 1, 2022 for the above noted proceeding.

In accordance with the OEB's revised Practice Direction on Confidential Filings effective December 17,2021, Enbridge Gas is requesting confidential treatment of the exhibit listed below and provides details of the specific confidential information for which confidential treatment is sought.

Exhibit	Description of Document	Confidential Information Location	Brief Description	Basis for Confidentiality
J1.1	Undertaking Response	Pages 1-2	Name and contact information of individual at National Grid.	Enbridge Gas was asked to provide the source to the participant value it used. The name of the specific individual at National Grid is not relevant – only the fact that Enbridge Gas sourced its participant value directly from National Grid. Enbridge Gas therefore requests confidential treatment on the basis of Section 11 of the OEB's Practice and Direction on Confidential Filings.

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

Sincerely,

Asha Patel

Digitally signed by Asha Patel
Date: 2022.04.19 15:47:56 -04'00'

Asha Patel
Technical Manager, Regulatory Applications

cc: D. O'Leary, Aird & Berlis
EB-2021-0002 Intervenors

ENBRIDGE GAS INC.

Undertaking Response to Pollution Probe

Undertaking

Tr: 160

To provide the computations and e-mail from Optimal

Response:

Below is an email exchange between Enbridge Gas and National Grid which confirms the participant value quoted by Enbridge Gas of 37,000 during the Oral Hearing. At the request of National Grid, the information to identify the individual has been redacted.

In order to determine what Enbridge Gas and National Grid believe to be a more reasonable lifetime m3 savings/participant, Enbridge Gas utilized the same numerator as identified in the response to 3-EGI-9-OEB.STAFF.2 of 231,757,448 lifetime m3 and replaced the incorrect denominator of 4,810 participants, utilized by Optimal Energy, with the National Grid recommended value of 37,000.

The outcome of this change was that the Optimal Energy calculated lifetime savings per participant of 48,182 m3 was reduced to 6,264 m3, or roughly half of the 12,404 lifetime m3 that Optimal Energy indicated Enbridge Gas was generating from its residential program.

From: [redacted]@nationalgrid.com>
Sent: Monday, April 4, 2022 2:04 PM
To: Scott Hicks <Scott.Hicks@enbridge.com>
Subject: RE: [EXTERNAL] Response to Undertaking JT1.1

Hi Scott,

I reviewed your email and agree with what is stated.

Best,

[redacted]
nationalgrid

[redacted]@nationalgrid.com
[redacted]
nationalgrid.com

From: Scott Hicks <Scott.Hicks@enbridge.com>
Sent: Monday, April 4, 2022 1:25 PM
To: [redacted]@nationalgrid.com>
Subject: [EXTERNAL] Response to Undertaking JT1.1

[redacted]

As per our previous discussion, Enbridge has been asked by the Ontario Energy Board to respond to an undertaking concerning our communications regarding the irregularities around the 2019 Residential Coordinated Delivery participant values Enbridge identified in the **"2022-2024 Statewide Data Tables - Gas"** and the subsequent recommended participant values you suggested we use instead.

Could you please reconfirm the following:

- On February 2nd, National Grid confirmed that the participant value of 4,810 as listed in the above-mentioned Data Table, in the 2019 Evaluated row for the Residential Coordinated Delivery Program is in fact a clerical error.
- On February 15th, understanding the clarity Enbridge was looking for, National Grid recommended that Enbridge use 37,000 participants instead, as this is more reflective of the overachievement National Grid realized against its planned target for 2019 of 32,907 participants, however is not a perfect proxy as the estimate does not exclusively represent unique participants.

Could you please confirm this for me in your response?

Again, really appreciate your time and consideration in helping us to provide clarity on this issue.

Scott Hicks
Supervisor, EC Process & Program Strategies
Energy Conservation

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Safety. Integrity. Respect. Inclusion.

ENBRIDGE GAS INC.

Undertaking Response to Environmental Defence

Undertaking

Tr: 168

To confirm whether the 15 percent adder was intended to include jobs and economic growth.

Response:

Confirmed.

In the consultation for the development of the 2015-2020 Natural Gas Framework (EB-2014-0134), some stakeholders recommended the OEB either include non-energy benefits as part of the TRC test calculation or adopt the Societal Cost (SC) test as the primary cost-effectiveness screening test. In the OEB's conclusions it determined:

> On October 23, 2014, the Minister of Energy amended his Conservation First directive to the OPA and made it mandatory that electricity distributor CDM programs are screened using the TRC test and "include a 15% adder to account for the non-energy benefits associated with the electricity CDM programs, such as environmental, **economic** **[emphasis added]** and social benefits." To effectively align natural gas DSM programs with electricity CDM programs and take into consideration government objectives outlined in the Conservation Directive to the OPA, the Board has concluded that the same approach should be used for screening DSM programs.[1]

In its DSM Mid-Term Review report, the OEB updated the TRC-Plus cost test maintaining the 15% non-energy benefit in addition to including the cost of carbon as follows:

> The natural gas utilities should include the federal cost of carbon as part of future avoided cost updates, as it is the most relevant public data source currently available. The OEB will also include the cost of carbon in the cost-effectiveness analysis undertaken as part of the annual program evaluation work. Additionally, the OEB will maintain the non-energy benefit adder of 15% currently included in the TRC-Plus cost-effectiveness test.[2]

[1] EB-2014-0134, Report of the Board, DSM Framework for Natural Gas Distributors (2015-2020) (December 22, 2014), p. 33.
[2] EB-2017-0127EB-2017-0128, Report of the Ontario Energy Board, Mid-Term Review of the DSM Framework of Natural Gas Distributors (2015-2020), (November 29, 2018), p. 28.

ENBRIDGE GAS INC.

Undertaking Response to Environmental Defence

Undertaking

Tr: 176

To calculate the net benefits per tonne of the lifetime CO_2 reductions arising from Enbridge's 2023 program.

Response:

The net benefits per tonne of lifetime CO2 reductions arising from Enbridge Gas's 2023 programs are calculated below. It should be noted that the net benefits include avoided carbon costs as these benefits were included in the study "Marginal Abatement Cost Curve for Assessment of Natural Gas Utilities' Cap and Trade Activities (EB-2016-0359)" referred to by Mr. Elson. However, it is unclear if the avoided carbon costs should be included when calculating a benefit per tonne of carbon. If the avoided carbon costs were excluded, the value below would be significantly lower although still positive.

TRC Plus Net Benefits 2023 ($)	A	$364,502,976
Net m3 cumulative gas savings 2023	B	1,732,912,070
TRC Plus Net Benefits $ / net CCM m3	C = A / B	0.2103
GHG conversion factor kg CO2 / m3	D	1.874
TRC Plus Net Benefits $ / kg CO2	E = C / D	$0.1122
TRC Plus Net Benefits $ / tonne CO2	F = E * 1000	**$112.24**

ENBRIDGE GAS INC.

Undertaking Response to Environmental Defence

Undertaking

Tr: 196

To extend the table in ED 20, page 4, out to 2027, and include a line showing the non-market transformation budgets in real terms, including clarifications where dollars have moved between programs.

Response:

Extensions to the table presented in Exhibit I.6.EGI.ED.20, part b have been provided below. It should be noted that the below table has also been updated from the initial response to account for a recategorization of the 2019-2022 Affordable Housing New Construction offering from the resource acquisition programming category to the market transformation programming category.

DSM Investments - 2019-2027 Budgets									
	2019 [2]	**2020 [2]**	**2021 [2]**	**2022 [2]**	**2023**	**2024**	**2025**	**2026**	**2027**
Total programs (nominal)	$104,256,598	$106,429,657	$106,429,657	$106,429,657	$112,099,380	$118,115,505	$124,380,665	$130,966,271	$137,888,489
Total programs (real $2019)[1]	$104,256,598	$105,885,459	$101,439,603	$99,450,591	$102,694,633	$106,084,339	$109,520,916	$113,058,568	$116,700,270
Resource acquisition (nominal) [3] (all but market transformation)	$94,813,519	$96,826,762	$96,826,762	$96,826,762	$99,797,287	$101,826,121	$103,862,643	$105,939,896	$108,058,694
Resource acquisition (real $ 2019) [1] [3] (all but market transformation)	$94,813,519	$96,331,665	$92,286,949	$90,477,401	$91,424,642	$91,454,181	$91,454,180	$91,454,180	$91,454,180
Market transformation (nominal)	$9,443,079	$9,602,895	$9,602,895	$9,602,895	$12,302,093	$16,289,384	$20,518,022	$25,026,375	$29,829,795
Market transformation (real $ 2019)[1]	$9,443,079	$9,553,793	$9,152,654	$8,973,190	$11,269,990	$14,630,158	$18,066,735	$21,604,388	$25,246,089
Total overhead	$19,947,784	$20,113,541	$20,113,541	$20,113,541	$23,053,142	$23,457,067	$23,926,209	$24,404,733	$24,892,829
Program overhead	$16,105,784	$16,271,541	$16,271,541	$16,271,541	$11,800,620	$11,979,495	$12,219,085	$12,463,467	$12,712,736
Portfolio overhead	$3,842,000	$3,842,000	$3,842,000	$3,842,000	$11,252,522	$11,477,572	$11,707,123	$11,941,266	$12,180,092
Portfolio costs (non-admin)	$6,986,164	$7,063,719	$7,063,719	$7,063,719	$7,107,478	$7,249,628	$7,394,621	$7,542,513	$7,693,363
Total budget	$131,190,546	$133,606,917	$133,606,917	$133,606,917	$142,260,000	$148,822,200	$155,701,494	$162,913,517	$170,474,680
Overhead as % of Total	15.2%	15.1%	15.1%	15.1%	16.2%	15.8%	15.4%	15.0%	14.6%
CPI Factor % from 2019 [1]	0.0%	0.5%	4.9%	7.0%	9.2%	11.3%	13.6%	15.8%	18.2%

[1] 2019-2021 applies CPI Factor from Bank of Canada as of September. 2022-2027 assumes annual 2% inflation factor.

[2] Confirmed that 2019-2022 amounts include incremental $1.5M for the Residential Thermostat offering in the Union Rate Zones, consistent with EB-2017-0127.

[3] 2019-2022 resource acquisition programs include Resource Acquisition, Low Income (excluding legacy EGD Affordable Housing New Construction offer), Large Volume, and Performance Based. 2023-2027 resource acquisition programs include Residential, Commercial, Industrial, Low Income, and Large Volume.

ENBRIDGE GAS INC.

Undertaking Response to Environmental Defence

Undertaking

Tr: 11

To calculate the total budget envelope based on a two dollar per month residential bill impact, based on three scenarios as described in JT1.5 for the division of the budgets between residential, commercial and industrial; to provide an additional table that calculates it based on $2.27 per month, which is an inflated value of the previous two dollar figure.

Response:

Please find data provided previously in JT1.5 restated below to include the addition of the 2020 Budget as requested.

As noted during the oral hearing, the $2.00/month was applied to the programs approved as part of the 2016 budget. Specifically, "[t]he OEB finds that the gas utilities have appropriately applied the DSM Framework's $2.00/month bill impact guidance as part of the proposed multi-year DSM plans."[1] As such, Enbridge Gas believes illustrations of 2016 and 2020 are appropriate years when considering the OEB's $2.00/month guidance provided in the current 2015-2020 DSM Framework. In order to be responsive Enbridge Gas has included 2014 values as requested however, inclusion of 2014 is not an appropriate comparison as the budget mix approved by the OEB for 2014 was developed and approved by the Ontario Energy Board under an earlier framework and was not subject to the $2.00/month guidance provided in the 2015-2020 DSM Framework.

Furthermore, Enbridge Gas notes that since the conclusion of the oral hearing at the end of March, the Ontario Ministry of Environment, Conservation and Parks (MECP) has released an updated Ontario Emission Scenario wherein it states:

> Ontario continues to support natural gas conservation (Demand Side Management (DSM)). As the Ontario Energy Board's decision on Enbridge's proposed 2023-2027 DSM plan is pending, MECP used a conservative illustrative scenario, assuming a 10% real increase in funding in 2030 (1.2% real/year in 2023-2030).[2]

[1] EB-2015-0029/EB-2015-0049, OEB Decision and Order, Applications for approval of 2015-2020 demand side management (January 20, 2016), p. 58.
[2] Ministry of the Environment, Conservation and Parks, Ontario Emissions Scenario (March 25, 2022), p. 3. https://prod-environmental-registry.s3.amazonaws.com/2022-04/Ontario%20Emissions%20Scenario%20as%20of%20March%2025_1.pdf

Table 1: Program Budgets by Sector as a Percentage of Total Program Budgets

Program Budgets by Sector as a Percentage of Total Program Budgets [1]	**2014 Budget**	**2016 Budget**	**2020 Budget** [5]	**2023 Proposed Budget**
Residential	9%	25%	33%	35%
Commercial	27%	42%	35%	19%
Industrial [2]	24%			15%
Low Income [3]	27%	24%	24%	21%
Other Programs [4]	13%	9%	8%	10%
Total Program (%)	**100%**	**100%**	**100%**	**100%**
Total Program ($)	**$48,354,309**	**$81,959,096**	**$106,429,657**	**$112,099,380**

1. Program administration and evaluation costs are not included

2. Industrial includes Large Volume

3. Low Income (2023) includes the Affordable Housing Savings By Design offering

4. Other programs consists of Market Transformation, Building Beyond Code (2023), Low Carbon (2023), Energy Performance (2023) programs

5. Budget include incremental $1.5M for the Residential Thermostat offering in the Union Rate Zones, consistent with EB-2017-0127.

The calculation based on the monthly residential bill impact of $2.00/month is presented below. It has been calculated with the same consideration as how calculations were done in Exhibit I.7.EGI.STAFF.17. The table below was prepared as follows for each scenario in a best attempt to generate the budget envelopes:

- The maximum residential budget was calculated by multiplying the residential customer count by the annual residential bill impact at $2/month
- The total residential percentage was calculated by adding the percentages from Table 1 that includes the residential program and the residential components of Low Income and Other Programs
- The total DSM budget bill impact was calculated by dividing the maximum residential budget impact by the total residential percentage
- The removal of the portfolio overheads, the 15% overspend access, and the maximum DSMI from the budget is completed to only include the program budget
- The Program Budgets by Sector are calculated by multiplying the row “- Remove Maximum DSMI” by the respective sector percentages in Table 1

Table 2: Program Budget Scenarios at $2 Per Month Residential Bill Impact

	2014 Budget Scenario	**2016 Budget Scenario**	**2020 Budget Scenario [6]**	**2023 Proposed Budget Scenario**
Residential Customer Count (EGD Rate 1, Union M1/R01)	3,463,392	3,463,392	3,463,392	3,463,392
Annual Residential Bill Impact at $2.00/month	$24.00	$24.00	$24.00	$24.00
Maximum Residential Budget Impact	$83,121,408	$83,121,408	$83,121,408	$83,121,408
Total Residential Percentage from Table 1 (Residential Program + % of Low Income + % of Other Programs)[1]	34%	45%	53%	54%
Total DSM Budget Bill Impact	$246,594,262	$182,862,469	$156,544,210	$154,680,973
- Remove Portfolio Overheads	$228,234,262	$164,502,469	$138,184,210	$136,320,973
- Remove 15% Overspend Access	$193,999,123	$139,827,099	$117,456,578	$115,872,827
- Remove Maximum DSMI	$172,709,123	$118,537,099	$96,166,578	$94,582,827
Program budgets by sector based on JT1.5 scenarios set to residential bill impact of $2/month [2]	**2014 Budget Scenario**	**2016 Budget Scenario**	**2020 Budget Scenario [6]**	**2023 Proposed Budget Scenario**
Residential	$16,323,944	$29,298,610	$31,368,378	$33,095,378
Commercial	$46,820,825	$49,885,545	$33,696,343	$18,156,600
Industrial [3]	$41,725,509			$13,855,912
Low Income [4]	$46,204,285	$28,863,419	$23,016,417	$19,956,195
Other Programs [5]	$21,634,560	$10,489,525	$8,085,441	$9,518,741

1. Percentages have been rounded to the nearest whole number.
2. Program administration and evaluation costs assumed to be embedded in the estimates.
3. Industrial includes Large Volume
4. Low Income (2023) includes the Affordable Housing Savings By Design offering
5. Other programs consists of Market Transformation, Building Beyond Code (2023), Low Carbon (2023), Energy Performance (2023) programs
6. Budget include incremental $1.5M for the Residential Thermostat offering in the Union Rate Zones, consistent with EB-2017-0127.

The calculation based on the monthly residential bill impact of $2.27/month is presented below. Table 3 is prepared applying the same methodology as explained above for Table 2.

Table 3: Program Budget Scenarios at $2.27 Per Month Residential Bill Impact

	2014 Budget Scenario	**2016 Budget Scenario**	**2020 Budget Scenario [6]**	**2023 Proposed Budget Scenario**
Residential Customer Count (EGD Rate 1, Union M1/R01)	3,463,392	3,463,392	3,463,392	3,463,392
Annual Residential Bill Impact at $2.27/month	$27.24	$27.24	$27.24	$27.24
Maximum Residential Budget Impact	$94,342,798	$94,342,798	$94,342,798	$94,342,798
Total Residential Percentage from Table 1 (Residential Program + % of Low Income + % of Other Programs)	34%	45%	53%	54%
Total DSM Budget Bill Impact	$279,884,488	$207,548,903	$177,677,678	$175,562,905
- Remove Portfolio Overheads	$261,524,488	$189,188,903	$159,317,678	$157,202,905
- Remove 15% Overspend Access	$222,295,814	$160,810,567	$135,420,027	$133,622,469
- Remove Maximum DSMI	$201,005,814	$139,520,567	$114,130,027	$112,332,469
Program budgets by sector based on JT1.5 scenarios set to residential bill impact of $2.27/month [2]	**2014 Budget Scenario**	**2016 Budget Scenario**	**2020 Budget Scenario [6]**	**2023 Proposed Budget Scenario**
Residential	$18,998,462	$34,485,057	$45,509,926	$39,306,137
Commercial	$54,491,957	$58,716,297	$48,887,388	$21,563,912
Industrial [3]	$48,561,823			$16,456,146
Low Income [4]	$53,774,403	$33,972,829	$33,392,719	$23,701,223
Other Programs [5]	$25,179,170	$12,346,384	$11,730,535	$11,305,051

1. Percentages have been rounded to the nearest whole number.
2. Program administration and evaluation costs assumed to be embedded in the estimates.
3. Industrial includes Large Volume.
4. Low Income (2023) includes the Affordable Housing Savings By Design offering.
5. Other programs consists of Market Transformation, Building Beyond Code (2023), Low Carbon (2023), Energy Performance (2023) programs.
6. Budget include incremental $1.5M for the Residential Thermostat offering in the Union Rate Zones, consistent with EB-2017-0127.

ENBRIDGE GAS INC.

Undertaking Response to Environmental Defence

Undertaking

Tr: 35

To provide incentive amounts across programs by measure.

Response:

The following table presents on a best-efforts basis incentives spent on the replacement or addition of gas-fired equipment in 2019 and in 2021. For custom measures, only clearly identified gas-fired equipment based on naming convention has been included. Project by project analysis has not been performed given the level of effort required.

As discussed during the oral hearing, changes in incentives between 2019 and 2021 are a function of multiple variables beyond the pandemic including program changes and changes in codes and standards.

Offering / Measure	2019	2021
Commercial & Industrial Custom	**$2,256,102**	**$4,782,608**
Boiler	$2,054,299	$4,208,153
Boiler or Steam Generator (Process)	$45,935	$75,461
CHP/Cogen		$394,641
Combi Oven	$22,364	
Combo System	$2,052	
Furnace	$32,933	
Hot Water Storage Tank (HWST)		$83,965
Oven	$97,891	
Water Heater	$630	$20,388
Commercial & Industrial Prescriptive	**$1,832,700**	**$942,950**
Boiler	$1,484,400	
Broiler	$800	$750
Combi Oven		$16,250
Convection Oven		$63,750
Fryer	$117,900	$599,250
Furnace	$21,600	
Infrared Heater	$143,200	
Rack Oven		$32,400
Steam Cooker	$3,900	$7,000
Unit Heater	$6,000	$26,000
Water Heater	$54,900	$197,550

Offering / Measure	2019	2021
Energy Leaders		**$240,000**
Gas Heat Pumps		$240,000
Home Efficiency Rebate	**$18,532,000**	**$4,540,450**
Boiler	$277,500	$496,000
Furnace	$17,490,000	$2,347,250
Water Heater	$764,500	$1,697,200
Large Volume Direct Access	**$93,022**	**$949**
Boiler		$949
Furnace	$93,022	
Low Income Furnace End-of-Life Upgrade	**$30,525**	
Furnace	$30,525	
Low Income Multi-Family - Custom	**$1,709,954**	**$1,959,993**
Boiler	$1,696,074	$1,958,138
Water Heater	$13,880	$1,855
Low Income Multi-Family - Prescriptive	**$1,071,189**	**$2,159**
Boiler	$940,718	
Furnace	$44,800	
Water Heater	$85,671	$2,159
Grand Total	**$25,525,492**	**$12,469,109**

ENBRIDGE GAS INC.

Undertaking Response to Environmental Defence

Undertaking

Tr: 41

To confirm that the Achievable Potential Study was prepared before the announcement of the 170 dollar per tonne carbon price, and to confirm whether the analysis of heat pumps was not based on cold climate heat pumps.

Response:

The 2019 Achievable Potential Study ("2019 APS") was initially published on September 13, 2019, with a version update completed December 10, 2019. The announcement for the carbon tax increase from $50 per tonne in 2022 to $170 per tonne in 2030 was announced December 11, 2020.

With respect to the analysis of heat pumps, the 2019 APS did consider cold climate heat pumps, and in a residential application they were considered not cost effective. This can be referenced in the 2019 APS on Page C-7, Table C-3, Residential Fuel Switching Measure List.

ENBRIDGE GAS INC.

Undertaking Response to Environmental Defence

Undertaking

Tr: 43

To confirm whether undertakings and directives given to the Lieutenant Governor-In-Council do not prohibit fuel switching as a DSM measure; to file undertakings and any directives given to the Lieutenant Governor-In-Council relating to fuel switching or eligible DSM activities.

Response:

Enbridge Gas is unaware of any recent undertakings or directives given to the Lieutenant Governor-In-Council which explicitly prohibit fuel switching as a DSM measure, nor any directives that specifically address fuel switching or define eligible DSM activities.

ENBRIDGE GAS INC.

Undertaking Response to Ontario Greenhouse Vegetable Growers (OGVG)

Undertaking

Tr: 195

To confirm the facts around the 2021 and 2022 number of unique participants versus projects units in this exhibit.

Response:

The 2021 and 2022 participants included in this exhibit represent an estimated forecast of the number of unique participants. As noted in the response to Exhibit I.5.EGI.GEC.5 the number of unique participants for 2021 and 2022 were forecasted based on the proportion of historical annual savings by rate class.

This approach assumes that the past annual savings distribution between rate classes for each offering are representative of the offering's unique participants distribution between each rate class. This is not accurate when some of those participating rate classes tend to have bigger or smaller projects than the other participants in the same offering and will tend to show higher participation for rate classes with larger projects.

Enbridge Gas recommends using the actual values from 2020 and prior (vs. estimated forecast values) when looking at unique participants.

ENBRIDGE GAS INC.

Undertaking Response to Ontario Greenhouse Vegetable Growers (OGVG)

Undertaking

Tr: 205

To provide the data for the requested fields in the table at Tab 5 of Exhibit K2.5.

Response:

Please see below for unique participants from contract rate classes (excluding T2 and Union R100) that participated in either Commercial or Industrial Custom offerings. This includes projects for Run it Right/RunSmart and Comprehensive Energy Management/Strategic Energy Management.

	2016 Number of Unique Participants	**2020 Number of Unique Participants**
K2.5 OGVG Compendium, p.44 and p.46		
Total DSM Contract Rate Classes (excludes T2 and R100)	201	165
Total Commercial Custom (I.5.EGI_GEC6_Attachment 1)	**618**	**743**
Commercial Custom-Participants from Contract Classes (excluding T2 and R100)	38	21
Total Industrial Custom (I.5.EGI_GEC6_Attachment 1)	**336**	**204**
Industrial Custom-Participants from Contract Classes (excluding T2 and R100)	151	124

ENBRIDGE GAS INC.

Undertaking Response to Energy Probe

Undertaking

Tr: 3

Amended version of the table.

Response:

On March 30, 2022, GEC/ED filed a corrected version on the expert evidence interrogatory response, Exhibit 10-EP-1-GEC/ED.1, which included the amended version of the table. See Attachment 1.

David I. Poch Barrister tel. (613) 264-0055 fax (613) 264-2878

March 30, 2022

Nancy Marconi, Registrar
Ontario Energy Board

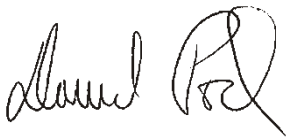
VIA RESS AND EMAIL

Dear Ms Marconi:

Re: EB-2021-0002, EGI 2023-27 DSM – GEC/ED IRR correction

Attached please find a corrected version of 10-EP-1-GEC/ED.1. (Which corrects for a formula error in the table which Ms Moore noted during today's hearing).

Sincerely,



Cc: All Parties

1649 Old Brooke Road, Maberly, Ontario K0H 2B0 e-mail: dpoch@eelaw.ca

10-EP-1-GEC/ED.1 Rev. 20220303

Ref: Ex. L.GEC/ED.1 page 5

Preamble: Enbridge's proposed plan will actually produce lower average annual savings than the Company achieved between 2017 and 2019.

a) Please provide the Comparison that this statement is based upon.

b) Does EFG agree that in most Sectors, particularly the residential sector, the ratio of savings (m3/$) are declining? Discuss the reasons for this.

c) Does EFG suggest the answer is to ramp up DSM budgets? If so what additional programs/measures for the residential sector would EFG propose e.g. exterior insulation wrap for older homes? Estimate the annual and 5-year cost for each proposed program/measure addition.

Response:

a) See the discussion on p. 8 and Figure 1 on p. 9 of our report.

b) The answer depends in part on what savings metric is being used, the period of time over which comparisons are being made and whether spending is being adjusted for inflation to enable a more apples-to-apples comparison. As the following table shows, the forecasted number of first year m3 saved per dollar spent in 2023 is not appreciably different, on an inflation adjusted basis, than the actual experience in 2017 through 2020.[1] For the residential sector, Enbridge's actual savings yields improved very slightly from 2017 through 2020 in inflation adjusted terms, and are forecasted to be about 20% higher in 2023 than the 2017 through 2020 values. EFG has not conducted an analysis to assess the reasons for this change.

	Spending (million nominal $)					1st Year Savings (millions m3)					1st Year m3 per 2021 $				
Sector	2017	2018	2019	2020	2023	2017	2018	2019	2020	2023	2017	2018	2019	2020	2023
Residential	$49.7	$53.1	$55.2	$49.6	$40.8	16.5	17.4	17.9	16.3	14.8	0.30	0.31	0.31	0.32	0.38
Low Income	$18.7	$21.4	$24.3	$20.9	$23.0	6.9	8.7	9.4	7.5	7.9	0.34	0.38	0.37	0.34	0.36
Com/Ind	$33.0	$32.0	$32.2	$27.4	$43.1	81.1	74.2	81.3	59.0	74.7	2.24	2.16	2.39	2.06	1.80
Large Volume	$2.6	$2.8	$3.1	$3.3	$2.8	9.5	8.1	7.0	12.2	9.3	3.29	2.66	2.17	3.50	3.50
Energy Perf.	$0.0	$0.0	$0.0	$0.0	$1.2	0.0		0.0		0.0	n.a.	n.a.	n.a.	n.a.	n.a.
Beyond Codes	$8.4	$9.3	$9.3	$8.2	$8.4	0.0		0.0		0.0	n.a.	n.a.	n.a.	n.a.	n.a.
Low Carbon	$0.0	$0.0	$0.0	$0.0	$4.6	0.0		0.0		0.0	n.a.	n.a.	n.a.	n.a.	n.a.
MT	$2.8	$3.1	$2.9	$2.0	$0.0	0.0		0.0		0.0	n.a.	n.a.	n.a.	n.a.	n.a.
Other	$0.4	$0.2	$0.4	$0.1	$0.0	0.0		0.0		0.0	n.a.	n.a.	n.a.	n.a.	n.a.
Portfolio	$11.4	$13.3	$11.0	$7.6	$18.4	0.0		0.0		0.0	n.a.	n.a.	n.a.	n.a.	n.a.
Total	$126.9	$135.3	$138.4	$119.0	$142.3	114.0	108.4	115.7	95.1	106.7	0.82	0.75	0.79	0.76	0.78

c) Yes, at least in part. While some increase in savings could be achieved by reallocation of the total annual budgets proposed by Enbridge. Increases on the order of magnitude necessary to ramp up to savings levels of North American leaders will also require absolute increases in total budgets.

[1] The savings and spending per sector in 2017, 2018, 2019 and 2020 are from the summary tables of the independent Evaluation Contractor's annual verification report. The 2023 budget is as proposed by Enbridge in Exhibit D, Tab 1, Schedule 1, p. 11 and the 2023 savings are as proposed by Enbridge for its 100% target in Exhibit D, Tab 1, Schedule 3, p.4

It should also be noted that a growing DSM program cost per unit of gas savings is not necessarily a "problem" that can or should be "fixed". Savings yields per program dollar can decline for a variety of reasons, including the elimination of a lower cost source of savings as a result of government codes or standards, an increased focus on more comprehensive treatment of efficiency opportunities, an increased focus on serving harder to reach customers, a significant increase in the level of savings being achieved, poor performance by program planners and delivery staff, etc.[2] If savings yields are declining because of poor performance, that would obviously be a problematic. On the other hand, there are many other potential reasons lower yields can be reasonable and acceptable given market conditions and policy objectives. EFG has not conducted the kind of detailed analysis necessary to offer comprehensive recommendations for modifications to Enbridge's proposed program portfolio. See response to 6.OEB.Staff.2.GEC/ED.1 for some higher-level recommendations.

[2] Savings yields can also increase for factors not attributable to utility. This could occur, for example, if the federal government implements its promised $40,000 zero-interest loans for green investments such as retrofits.

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Tr: 119

(A) to make best efforts to advise what percentage of volumes of M1 and 01 are non-residential customers; (b) to include in that what the allocation of non-residential programs is to rates m1 and 01, the costs that are allocated to those under your current proposal for 2023 that are not for residential customers.

Response:

a)

Rate Class	Percentage of Volumes for Non-Residential Customers
Rate M1	24%
Rate 01	26%

b)

Rate Class	Estimated Cost Allocation for Non-Residential Customers for the Proposed 2023 DSM Budget	Percentage of Costs for Non-Residential Customers
Rate M1	$3,565,757	13%
Rate 01	$1,460,184	24%

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Tr: 123

To advise the Board what the additional amounts are in the report.

Response:

Enbridge Gas can confirm that the $7.2M of “costs for pension and benefits” provided in JT2.16 is inclusive of employee incentive compensation, including an allocation for costs related to Enbridge’s Long Term Incentive Plan (i.e. Stock Based Compensation).

As noted in JT2.16, without undergoing a cost study the exact amount attributable to DSM for general overhead related costs cannot be determined. The estimated value mentioned in JT2.16 of $35,000-$50,000 per FTE is the Company’s best available estimate of general overhead costs attributable to DSM, inclusive of allocations attributable to Central Functions (including costs for facilities, information technology, and other common costs).

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Tr: 133

To provide on a best efforts basis for 2022 what the total space and water-heating load is expected to be.

Response:

Enbridge Gas is not able to provide a response to this undertaking as it does not track space and water-heating load. However, if it is useful Exhibit I.5.EGI.ED.12 provides total Ontario gas consumption for which Enbridge Gas has commodity price data, Exhibit I.10.EGI.ED.24 provides the total number of Enbridge Gas customers and volumes by service type and sector, and Exhibit I.10.EGI.ED.29 provides the average annual consumption for a typical customer by rate zone (note that the interrogatory asked for a breakdown by space and water heating which Enbridge Gas was not able to provide as it does not track this information).

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Tr: 140

To provide an update to the forecast for federal carbon charges, shown on page 27.

Response:

For the federal carbon charges shown on page 27 of Exhibit K3.8 the corresponding natural gas forecast has not been updated based on the proposed higher carbon prices.

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Tr: 146

To provide the updated free ridership mitigation strategy April of 2021.

Response:

Please see Attachment 1 for the free ridership mitigation strategy from April 2021. Enbridge Gas took a comprehensive approach in updating its strategy by identifying many potential contributing factors based on past impact evaluations, industry practices and feedback from internal and external stakeholders regarding program design, delivery, and evaluation. The result is a set of initiatives that are at various stages of implementation. These initiatives are further detailed in evidence in the following locations:

- Exhibit E, Tab 1, Schedule 4, page 12;
- Exhibit E, Tab 1, Schedule 5, page 14;
- Exhibit I.10c.EGI.STAFF.47; and
- Exhibit I.10c.EGI.STAFF.48.

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Commercial & Industrial Free Ridership Mitigation Strategy

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Starting Point (S)

Current Net-to-Gross (NTG) Methodology

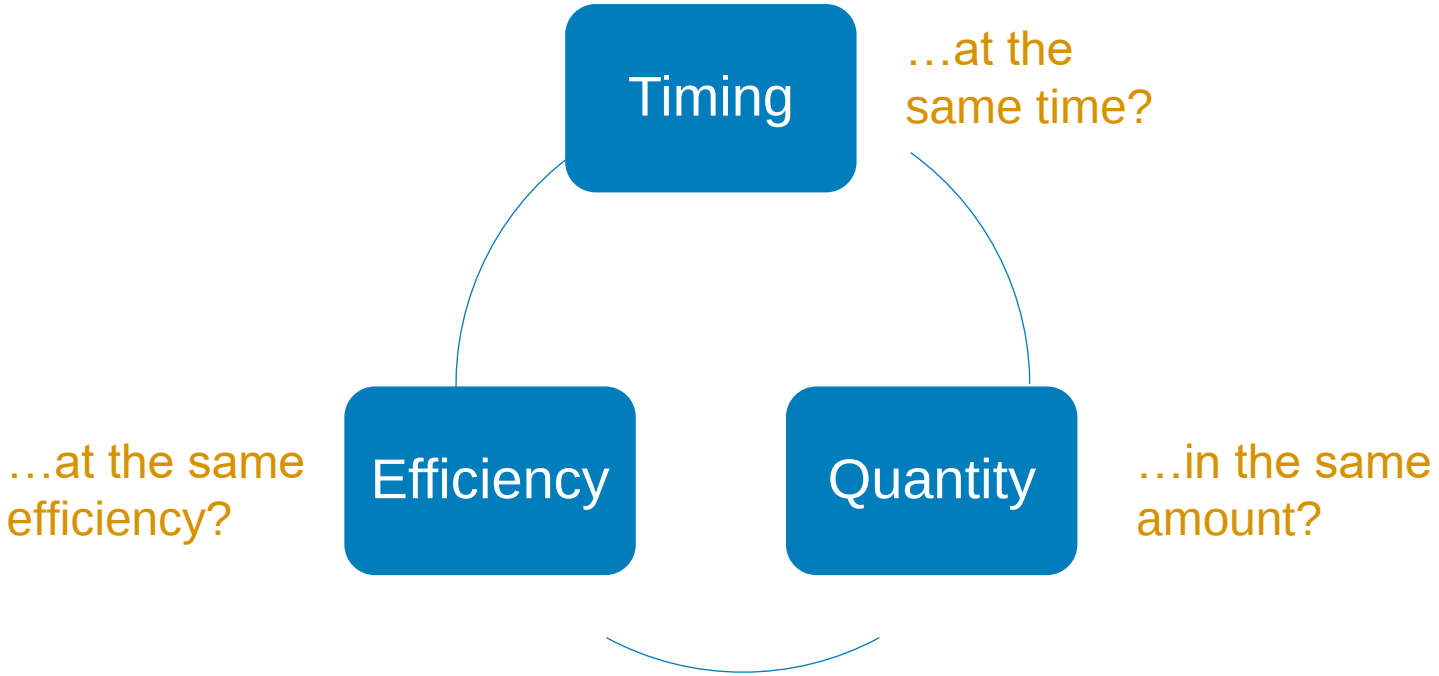
Definition and Goal

Free rider: “A program participant who would have installed a measure fully or partially on his or her own initiative even without the program.”

The primary goal of C&I Custom/Prescriptive programming is to maximize **net savings**

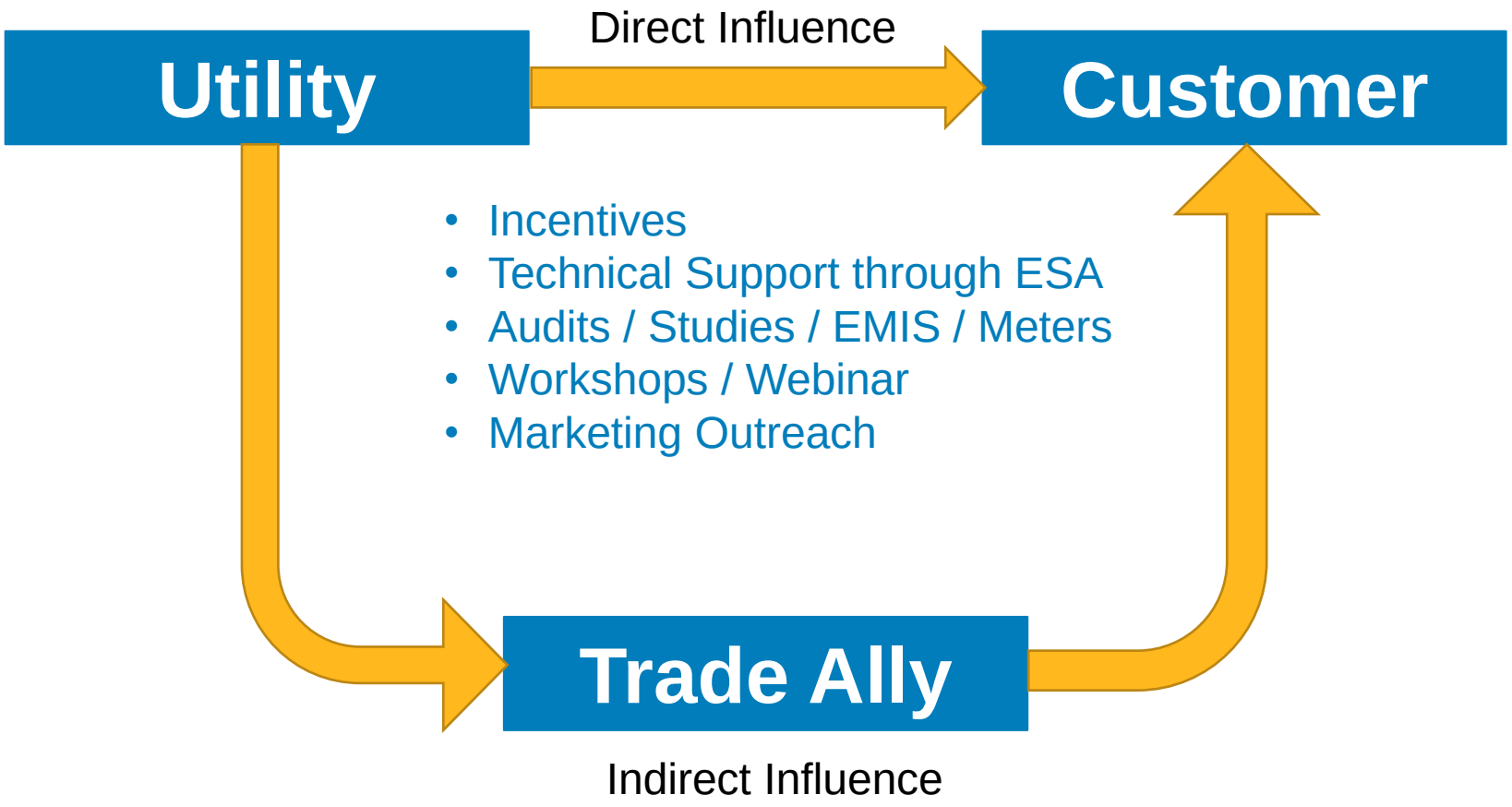
- ✓ This depends on minimizing free ridership in order to maximize NTG values
- ✓ This depends on being influential with customers according to this criteria below

Would the customer have otherwise installed something…



Current NTG Methodology

Influencers



Current NTG Methodology

Free Ridership rates for C&I offers

L-EG Custom Offer	2018 FR Study
Com Boilers	56.27%
Com Other	72.99%
Com Ventilation	84.52%
Com New Construction	73.00%
Industrial	47.93%
MR MF Heating	34.09%
MR MF Other	22.03%

L-UG Custom Offer	2018 FR Study
Agriculture & Greenhouse Custom	48.95%
Commercial Custom	71.38%
Industrial Custom: Furnace or Dryer	95.00%
Industrial Custom: Productivity Improvements	95.00%
Industrial Custom: Steam or Hot Water System	70.13%
Industrial Custom: HVAC	59.23%
Large Volume	84.69%
New Steam Trap Projects	50%*

Prescriptive (2022)	2017 FR Study*	Prescriptive (2022)	Not Assessed in 2017 FR Study
Air Curtains	50%*	Dock Door Seals (Compression & Shelter)	50%
ERV & ERV Improved Effectiveness	70%*	HRV & HRV Improved Effectiveness	5%
		Condensing Make-up Air Unit	5%
DCV with CO_2 Sensors	92%*	Ozone Laundry	8%
DCKV	38%*	Destratification Fans	10%

Custom Notes:

- Not studied, Assumed Rate

Prescriptive Notes:

- Only selected measures were studied in the 2017 FR study, as indicated in the right column.
- This chart assumes the rates for 2022.

Current free ridership rates (blended **57%** for Industrial and **60%** for Commercial Custom based on annual gas from 2019 combined LUG/LEG) represent a significant opportunity to increase net savings, net benefits and cost effectiveness.

Free Ridership Mitigation Strategy

Audit and Evaluation

- **Takeaways from the 2018 Custom C&I NTG Study**
  - ✓ A high proportion of projects had no influence (100% free riders)
  - ✓ Vendor attribution increased program attribution (L-EG Multi-Res and Commercial Custom);
  - ✓ Most influence is associated with accelerating the timing of projects
  - ✓ Need to complete a process evaluation

- **Takeaways from the 2020 Commercial Program Process Evaluation**
  - ✓ Strengths:
    - Incentives, Technical support of ESAs & BPs, and Ease of application process drive participation
  - ✓ Recommendations:
    - Clarify eligibility rules
    - Higher incentive levels to allow for engaging deeper and broader tiers of customers
    - Develop a formal trade ally network and online portal

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Causes and Pivotal Question (C, Qu)

Free Ridership Mitigation Strategy

Contributing Factors to Free Ridership

- **Program Design (in EGI's control)**
  - ✓ Artificially low baselines and long EULs for common measures
  - ✓ Insufficient screening criteria in the program rules
  - ✓ Incentives not sufficient to influence customer decision making
- **Program Delivery (in EGI's control)**
  - ✓ ESAs claiming projects in which EGI had no influence
  - ✓ Programs/ESAs measured on pre-audit results not providing enough incentive to screen projects
  - ✓ Trade Allies not representing EGI's incentive program in a way that demonstrates our influence
- **Program Evaluation (EGI can influence, but is not in control)**
  - ✓ Delayed surveys
  - ✓ Spillover not fully accounted for
  - ✓ Limitations in methodology – e.g., insufficient recognition of EGI influence through business partners
  - ✓ Lack of actionable feedback from external audit

How do we increase our influence, by addressing the key causes, and without making participation overly restrictive, to reduce FR rates to **<50%?**

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Answer (A) – the what, not the how

—

Free Ridership Mitigation Strategy

The Answer

- **What we are doing today:**
  - ✓ Redesigning incentives for 2022+ Plan
  - ✓ Removal of mainstream measures from offer and adjustments to savings calculation baselines based on ISP
  - ✓ Pre-project screening process by Industrial ESAs
  - ✓ Perform a process evaluation in order to get **in-depth actional feedback**
- **What we need to do going forward:**
  - ✓ Strengthen accountability with **Trade Allies** to ensure EGI's influence is recognized in vendor's sales process
  - ✓ Implement **internal fast feedback** NTG surveys to better inform the effectiveness of design and delivery
  - ✓ Harmonize the custom application process to **align best practices** from a screening perspective
  - ✓ Continue with **ESA Training** on free ridership mitigation as they are ultimately the best judge
  - ✓ Improve **NTG evaluation methodology**
    - Engage with the EC when they scope out NTG studies
    - Develop the Evaluation protocols to improve the high-level approaches to NTG evaluation methodology

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Recommendations (RE) – a workable plan

Recommendation #1

Custom Incentive Re-design

- ✓ **Scope**
  - Increased the published incentive rules for Commercial and Industrial custom
  - Market to customers the availability of discretionary funds to overcome payback hurdles where the published incentives are not enough (subject to clear terms, conditions and timing)
- ✓ **Timing**
  - TBD
- ✓ **Cost**
  - Accounted for in 2022+ Plan Application
- ✓ **Who's accountable**
  - Program Design
- ✓ **How it will benefit in reducing free ridership:**
  - Higher incentives will enable more projects to achieve their desired payback and therefore proceed
  - Demonstrate to the OEB the strategic use of incentives

Recommendation #2

EGI-Led Fast Feedback (a.k.a. “mini NTG”)

- ✓ **Scope**
  - Internally led; driven by EGI and not the OEB
  - A third party to complete NTG survey sample of customers and trade allies (TAN) shortly after project completion
  - All C&I R/A offers: Custom, Prescriptive Downstream, Direct Install, Prescriptive Midstream
- ✓ **Timing**
  - Design in 2021; Procure and Implement in 2022 on a pilot scale
- ✓ **Cost**
- ✓ **Who’s accountable**
  - Program Design, Evaluation
- ✓ **How it will benefit in reducing free ridership:**
  - Provide actionable and timely feedback to program design and delivery, e.g., supports re-training, improved marketing and messaging
  - Inform estimates of prospective NTG values ahead of external audit
  - Strengthens case for EC-led fast feedback in the OEB-led audit process
  - Potential to measure delivery teams in PD & Sales **on estimates of net savings**

Recommendation #3

Enhanced Screening through Program Rules and Governance

- ✓ **Scope**
  - Redesign and align the Commercial and Industrial Custom application processes and align best practices from a free-ridership screening perspective
  - Define criteria to enhance screening in the TRM offers
  - Consider the migration of LEG to Guardian in 2022
- ✓ **Timing**
  - Design and operationalize new process and offer criteria in time for 2022 launch
- ✓ **Cost**
- ✓ **Who's accountable**
  - Program Design – Program rules and Governance of 3rd party delivery;
  - Sales – Governance of in-field delivery by ESAs
- ✓ **How it will benefit in reducing free ridership**
  - Introduce consistent program rules and practices to strengthen screening and project governance
  - Support Sales and Trade Allies to properly capturing influence

Recommendation #4

Continued ESA Training

- ✓ **Scope**
  - ESA training on NTG studies; developing understanding of what drives free ridership
  - ESA training on project / offer pre-screening and governance; leading to better decisions being made in the field that help reduce FR, ensuring the offer's eligibility/restrictions rules are properly followed
- ✓ **Timing**
  - Training: Q3/Q4 2021
- ✓ **Who's accountable**
  - Program Design (Process); Sales (Execution)
- ✓ **How it will benefit in reducing free ridership**
  - Better management of free ridership from the field

Recommendation #5

Trade Ally Accountability

- ✓ **Scope**
  - Identification of target offers and associated service provider groups to support offers with consideration to interactive impacts between sectors, offers, measures, account managed and non-account managed customer groups
  - Design of T/A eligibility requirements, training materials and support tools (portal, marketing, benefits, etc.) to ensure a coherent and consistent market approach
- ✓ **Timing**
  - Network/offer strategy and development – Q3 of 2021
  - Dependent upon formalized Trade Ally Network approach
- ✓ **Cost**
- ✓ **Who's accountable**
  - PD CI & Res Offer Leads
- ✓ **How it will benefit in reducing free ridership**
  - Better position utility influence to include measurement at a service provider level
  - Training, eligibility requirements and more structured QA/QC process will support proper screening and substantiation of projects
  - Sales training, marketing & other T/A support tools will root utility programs into service provider conversations with customers

Recommendation #6

Advocate for Improvements to Program Evaluation

- ✓ **Scope**
  - Delayed surveys – Reach an agreement from the EC for future NTG studies to be conducted closer to the project date (and possibly in real-time)
  - Spillover needs to be thoroughly assessed – File a request in the 2022+ Framework: Spillover and FR need to be assessed equally; further engaged in the NTG study scope to influence the specifics of how thoroughly spillover is addressed
  - Limitations in methodology – File a request in 2022+ Framework to OEB to direct OEB staff to develop Evaluation Protocols, to consider (1) self-report has limitations/errors, and (2) other methodologies being used in other jurisdictions (like Delphi Panel)
  - Lack of actionable feedback – EGI perform a process evaluation in order to get in-depth feedback on NTG
- ✓ **Timing**
  - File in 2022+ Framework & through continuous engagement with EC
- ✓ **Cost**
- ✓ **Who's accountable**
  - Evaluation (Haris) – Lead
- ✓ **How it will benefit in reducing free ridership**
  - Better capture EGI influence through future NTG studies

Rollout Plan (Draft)

CI Free Ridership Mitigation

Time Frame			2021 May	June	July	Aug	Sept	Oct	Nov	Dec	2022 Jan	Feb	Mar	April	May	June
No.	Scope	Lead														
1	Custom Incentive Re-design	PD	Design								Implement					
2	EGI-Led Fast Feedback ("mini NTG")	PD; Evaluation	Deisgn								Implement					
3	Enhanced Screening through Progam Rules and Governance	PD Design; Sales Implementation	Design						Implement							
4	Continued ESA Training	PD Design (Process); Sales Implementation	Design							Implement						
5	Trade Ally Accountability	PD (CI & Residential)	Design								Implement					
6	Advocate for Improvements to Program Evaluation	Evalulation	Ongoing Engagement													

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Q & A

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Undertaking

Tr: 163

To file a copy of the study on E tools

Response:

The eTools validation study phase one report is provided at Attachment 1.

ETOOLS BOILER TOOL VALIDATION: PHASE ONE

Ontario Energy Board

January 20, 2022

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1 SUMMARY

This memo reports on analysis completed during Phase One of the study of Enbridge Gas Inc.'s (EGI) eTools energy modelling software. EGI uses eTools to estimate gas savings from installation of energy-efficient boiler equipment offered through EGI's Custom Commercial Program and Affordable Multi-Family Housing Program. These programs offer customers incentives and guidance related to specific retrofits at their buildings which typically include efficiency upgrades to the boilers. The findings will be used to provide guidance on whether eTools can be relied on to estimate savings for the purposes of the Ontario Energy Board's (OEB) Custom Savings Program Verification evaluation.

EGI has used eTools to estimate natural gas savings for many years. 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, for the purposes of calculating performance incentives and lost revenues.

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 directly. The purpose of Phase One 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 70%, 62%, and 64%. This means that the evaluated results were 62% to 70% of the eTools results. If described instead as an overestimation percentage, the three methods showed that eTools results were 43% to 61% higher than the evaluated results measured using a before and after billing analysis.

As shown in Table 1-1, 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 4-4 and Figure 4-5) 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 One. This difference needs to be investigated further.

These RRs are conservative values because the billing analysis savings (in the numerator) are all advancement savings[1] (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

[1] 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.

aligned, the resulting RR would be greater than one (>100%) making the difference in savings larger than indicated by these results.[2]

Table 1-1. Realization rates regression vs. quotient of sums

Population	Regression Trend RR		Ratio-Estimator RR
	Savings	% of Consumption	
Full analysis population	62%	64%	70%

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 in energy usage and their impacts can result in either large positive or negative changes in 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. 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.

[2] 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.

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 One are preliminary results only. There are many known limitations, discussed in the memo body, to the comparison as it was done in Phase One that could make the actual performance of the e-Tools model better or worse than the preliminary numbers. Phase Two is intended to address the identified limitations from Phase One.

2 OBJECTIVES

The objectives of Phase One 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 projects attributes and the alignment of eTools and billing analysis savings.
- Establish and maintain transparency throughout the project.
- Follow industry best practices.

3 APPROACH

The analysis approach had the following stages: data cleaning, weather-normalized savings calculation, site selection, and comparison of calculated savings with eTools modeled savings. Table 3-1 provides a summary of differences between the billing analysis and eTools approaches that could impact results.

Table 3-1. Summary of differences across billing analysis and eTools approaches

Area	Billing analysis	eTools	Comments
Data sufficiency	Two years pre- and post-implementation, actual reads only, minimum number of data points overall and in heating season, limited missing	Unclear, but appears to be one year pre-implementation, no restrictions on actuals, number of data points or missing values	Best practice: Limiting to actual reads, 12 data points, sufficient seasonal data to support heating trend.
Weather-normalizing regressions	Variable degree-day, separate for pre- and post-implementation	Fixed degree-day base	Variable degree-day offers the greatest flexibility to optimize to data

Area	Billing analysis	eTools	Comments
Weather data	Calculate heating degree days (HDD) for specific days in each actual data bill period	Calendar month HDD	HDD for specific consumption days is essential to establish correlation
Weather normals	Required daily normals for variable DD modeling, 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)	Mix of 1970-2000 and 1980-2010 normals. Both not representative of expected temperatures during EEM expected useful lives	Minimal effect on results. Also compared results based on fixed DD models using consistent normal.
Baseline efficiency in savings estimate	Existing efficiency (advancement savings)	Mix of existing and standard code (advancement and 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 lower billing analysis result but are extremely unlikely to explain the majority of it.

3.1 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. In contrast to the eTools weather normalization procedure which 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. First, data dated close to the project start date in eTools–three months before start date and the first three heating months afterward—were removed to account for lags in data entry or adjustments to the new equipment. Then the two years prior to this "blackout period" were defined as the pre-intervention analysis period and the two years afterward as the post-intervention analysis period.

3.2 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 time period for a range of heating degree-day bases; and (2) choosing an optimal model (with the best fit, as measured by the coefficient of determination R^2) from among all of these 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.[3]

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

[3] 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.

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:

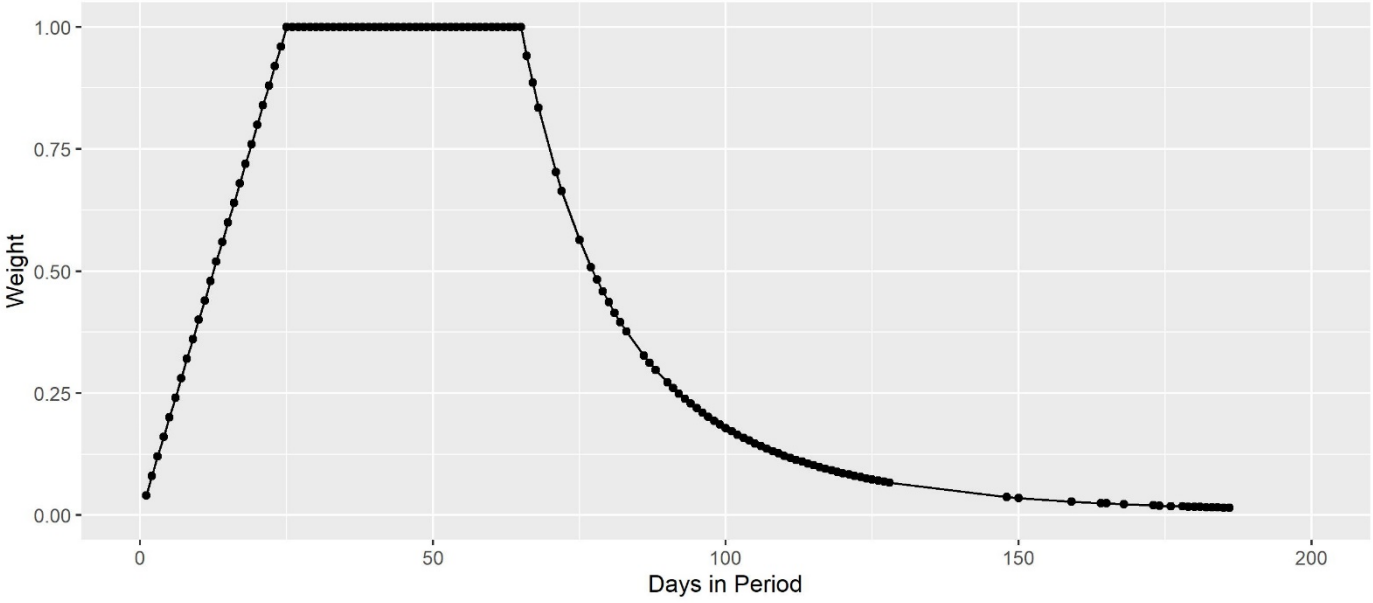
$$Weight = 65 - \left(\frac{65}{Number\ Days}\right)^4$$

Datapoints with fewer than 25 days (Figure 3-1) 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.[4] Points shown in Figure 3-1 represent data points in the model, but many points may be in the same spot. The majority of points fall in the weight =1 category. Fifteen points representing periods longer than 200 days are excluded.

Figure 3-1. Visual of weighting schema



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.

[4] It is not uncommon to weight using count of days to account for the different amount of daily data in different length periods. This analysis diverges from that here primarily because longer read periods are down-weighted rather than letting them get extra weight. The longer read periods actually have less information to support heating trends, so deserve a lower weight.

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*.

3.3 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 which 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 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 leaves 475 total sites for analysis. A summary of number of sites retained after each elimination step is shown in Table 3-2.

Table 3-2. 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 3-3. 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 3-4.

Table 3-4. 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

3.4 Comparison of eTools and Evaluated Savings

DNV received data on 456 projects from EGI, as they were 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.[5]

For the remaining sites/projects, DNV calculated several metrics to compare eTools-estimated to evaluated savings:

[5] 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.

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 over all evaluated projects to eTools claimed savings for the same projects:

$$\frac{\sum Evaluated\ Savings}{\sum ETools\ Savings}$$

These metrics do not represent a full picture of all projects where savings were calculated through the eTools workbook, as projects for this analysis where the evaluated results are most likely to accurately represent normalized energy use and savings were selected as described in Section 3.3.

4 RESULTS

The highest preliminary RR for this analysis was 0.70, meaning that only 70% 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 but are not fully explained by this analysis. DNV recommends that further explanatory analysis be conducted through Phase 2 of this project.

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 over-estimating savings. Also, it as has been acknowledged from the beginning of the analysis, pre-post analyses of this sort can be sensitive to NREs or other exogenous trends. Finally, 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, and

- 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 exogenous 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 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 4-1 shows that total evaluated pre-project consumption is an average of 3.75% higher than eTools estimates.

Figure 4-1. Pre-project consumption

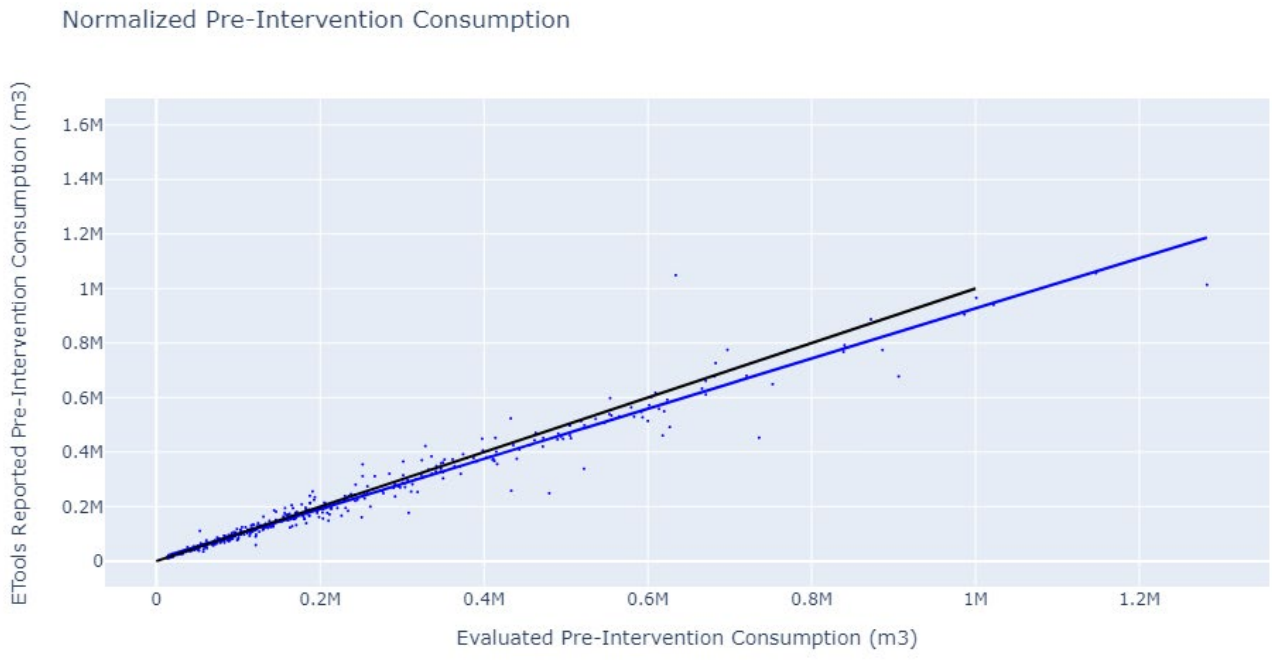
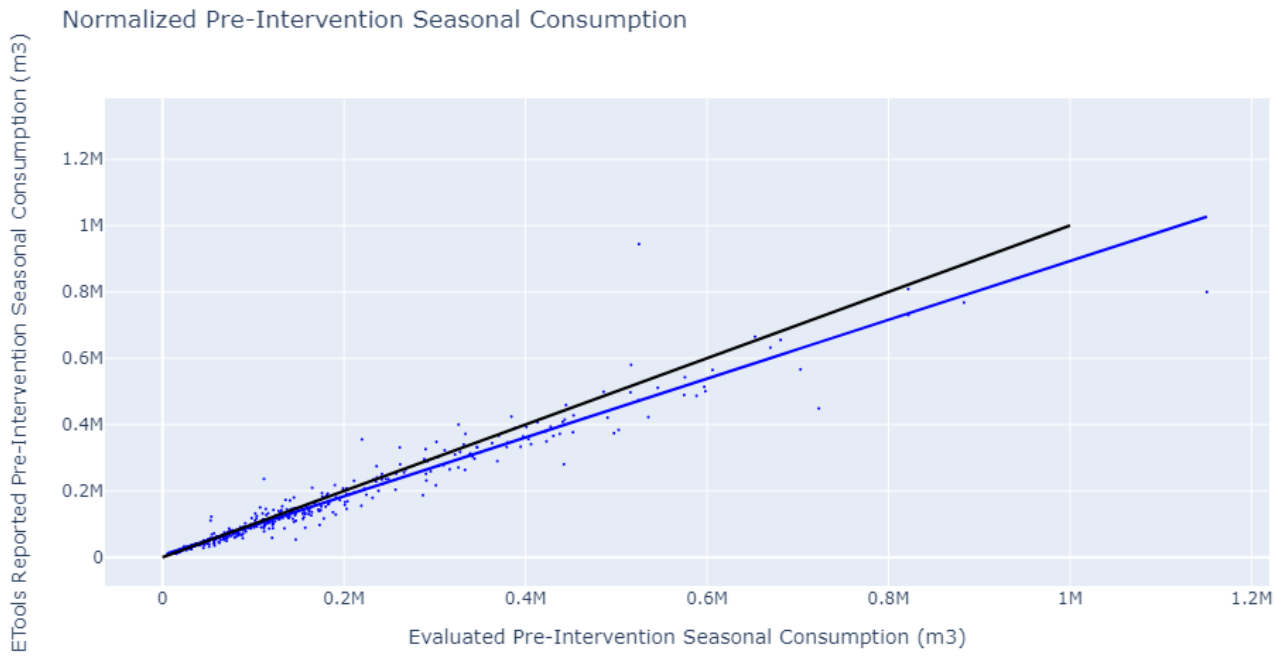


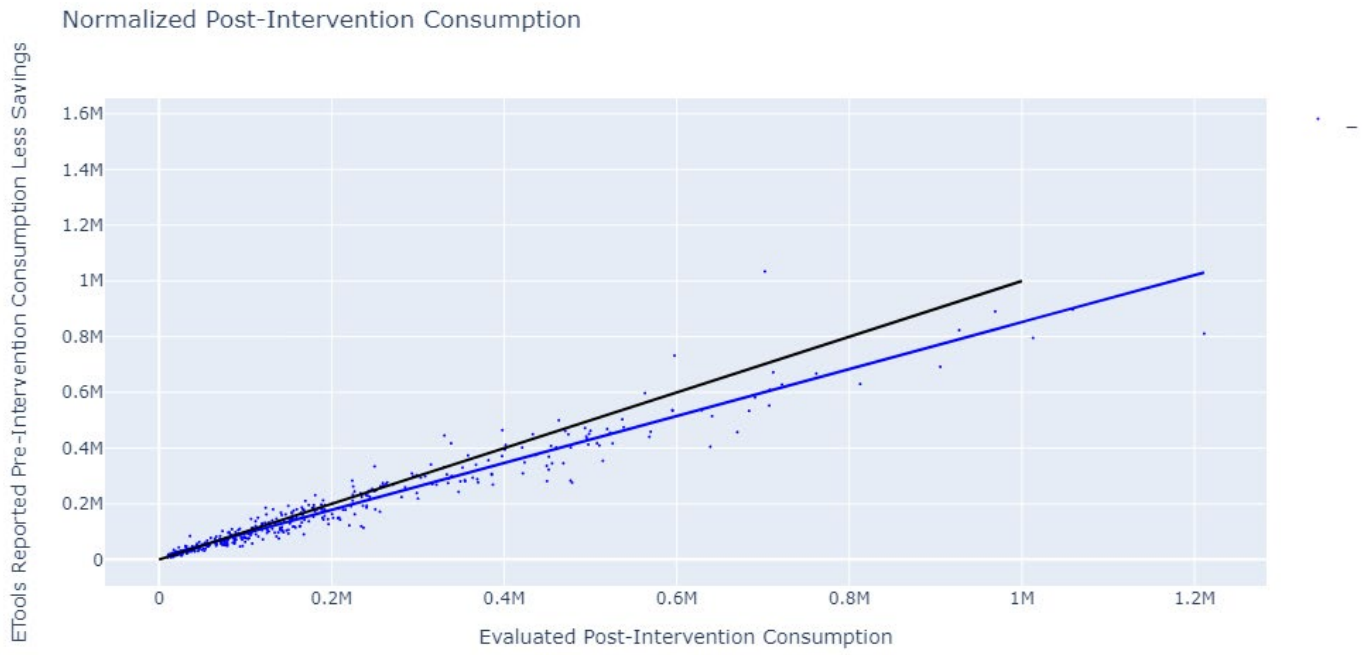
Figure 4-2 shows that the evaluated seasonal pre-project seasonal consumption is greater than eTools estimates by an average of 7.7%. Overall, however, these values show high correlation.

Figure 4-2. Pre-project seasonal consumption



Because eTools does not provide post-period consumption, it was calculated by subtracting savings from pre-period consumption. On this metric, evaluated estimates are 12.1% higher than eTools estimates, which follows from the lower overall evaluated savings estimates (Figure 4-3).

Figure 4-3. 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 are due to the program intervention, on average. While Figure 4-4 and Figure 4-5 (displaying m^3 saved and fraction consumption saved) appear to show limited correlation between these estimates, a simple regression-based RR (e.g., forced through zero) produces an estimate of 62% with greater than 90/10 precision. 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.

Figure 4-4. Comparison of consumption saved (m^3) with 1:1 trend line

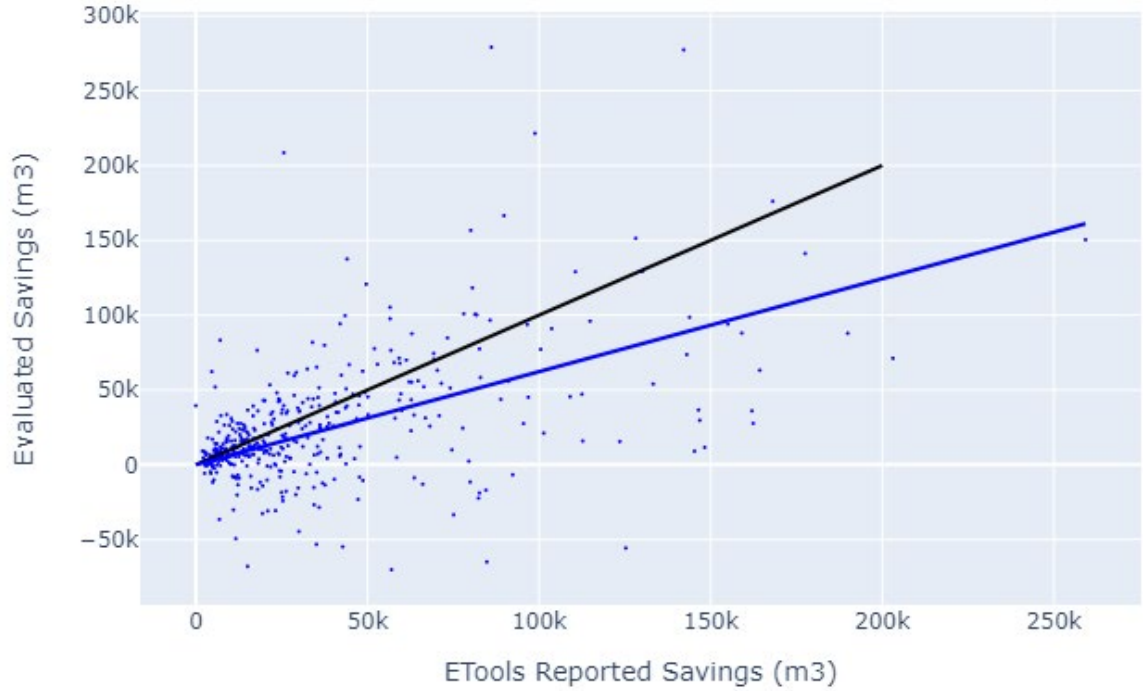


Figure 4-5. Comparison of fraction of consumption saved with 1:1 trend line

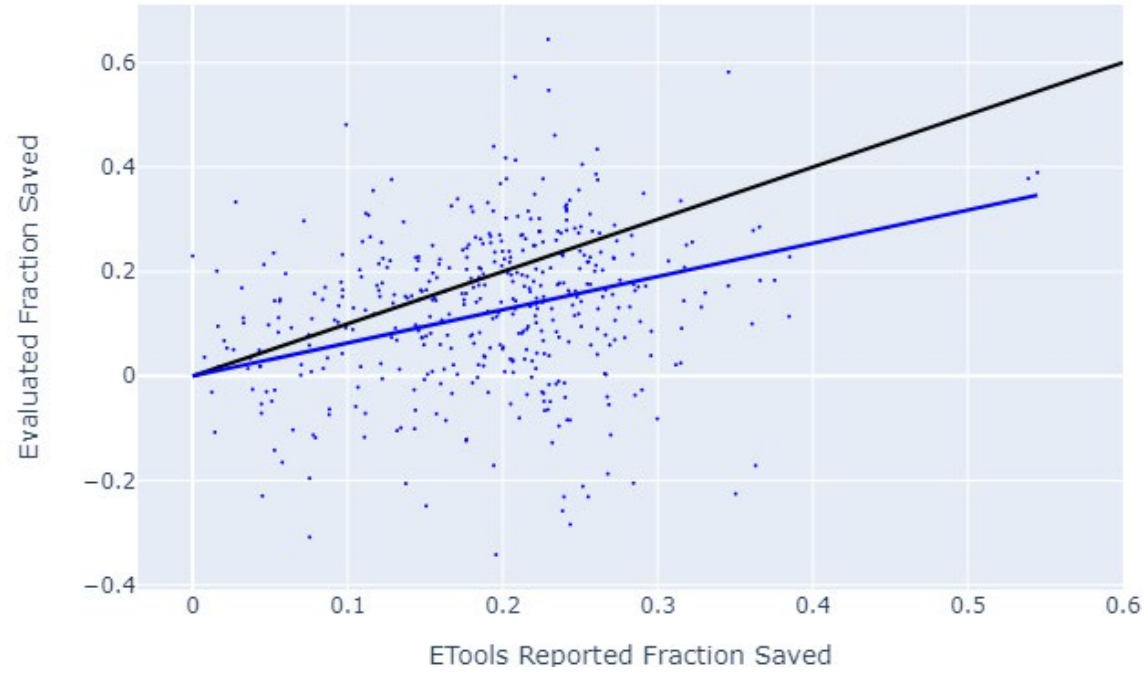
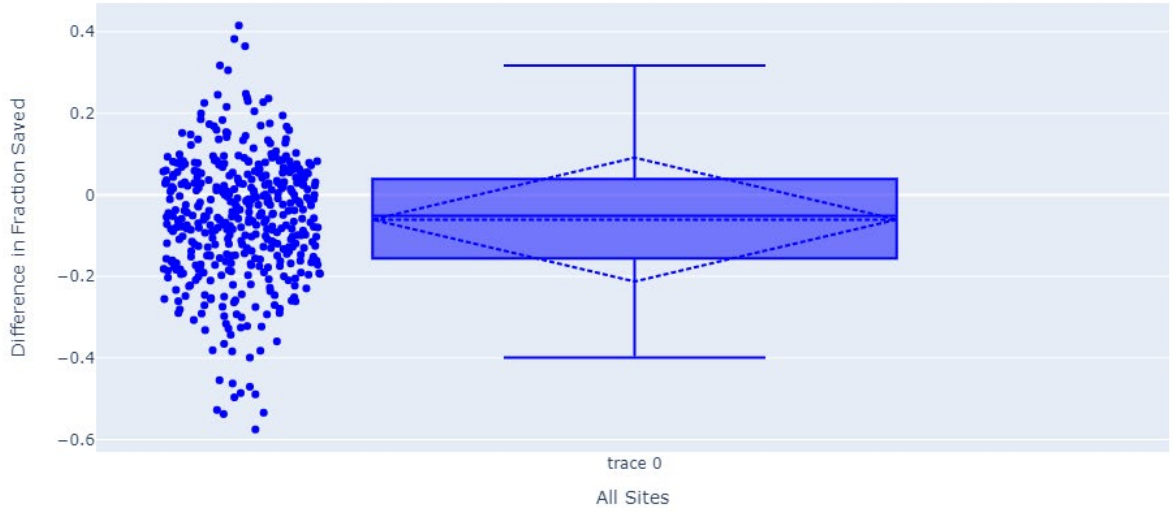


Figure 4-6, similarly, shows the difference between these two fraction-saved numbers, i.e., Evaluated Fraction Saved less eTools Fraction Saved.[6] Thus, if the evaluated fraction saved is greater, this number will be greater than zero; if the evaluated fraction saved is smaller, this number will be 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 4-1 and Figure 4-3. Pre- and post-installation consumption are 4% and 12% higher than eTools, respectively, driving a roughly 8 percentage point difference in savings.

Figure 4-6. Spread of difference in fractional savings



The next series of graphs explores if some types of projects may show eTools savings closer to evaluated savings. However, so far, no obvious groups with high correlation have been identified. Figure 4-7 may indicate that the estimation of water heating savings is more accurate than space heating, though the differences are not statistically significant.

[6] 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 4-7. Difference in savings by intervention type

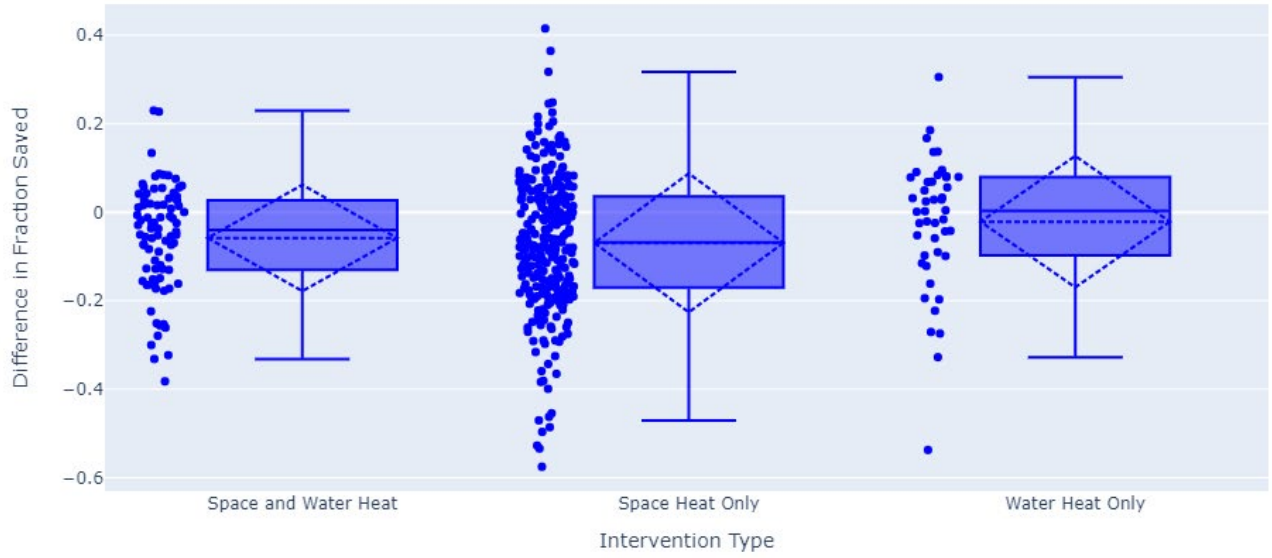
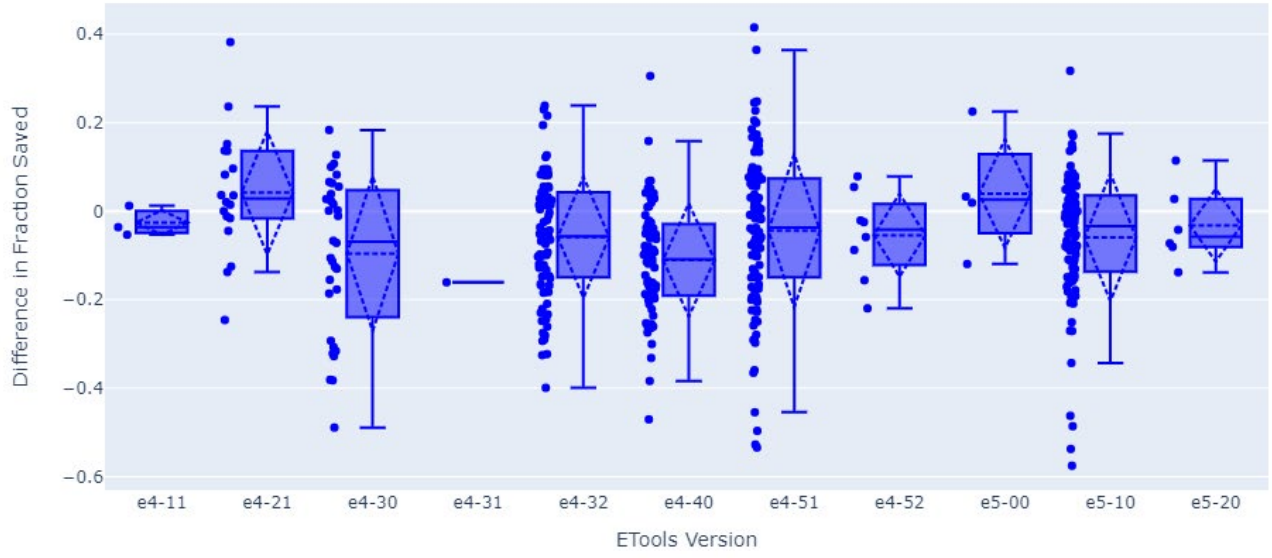


Figure 4-8 shows variation across eTools versions[7] but nothing that is statistically significant. There is no visual evidence of an upward trend in the results that might indicate movement to more accurate savings estimates.

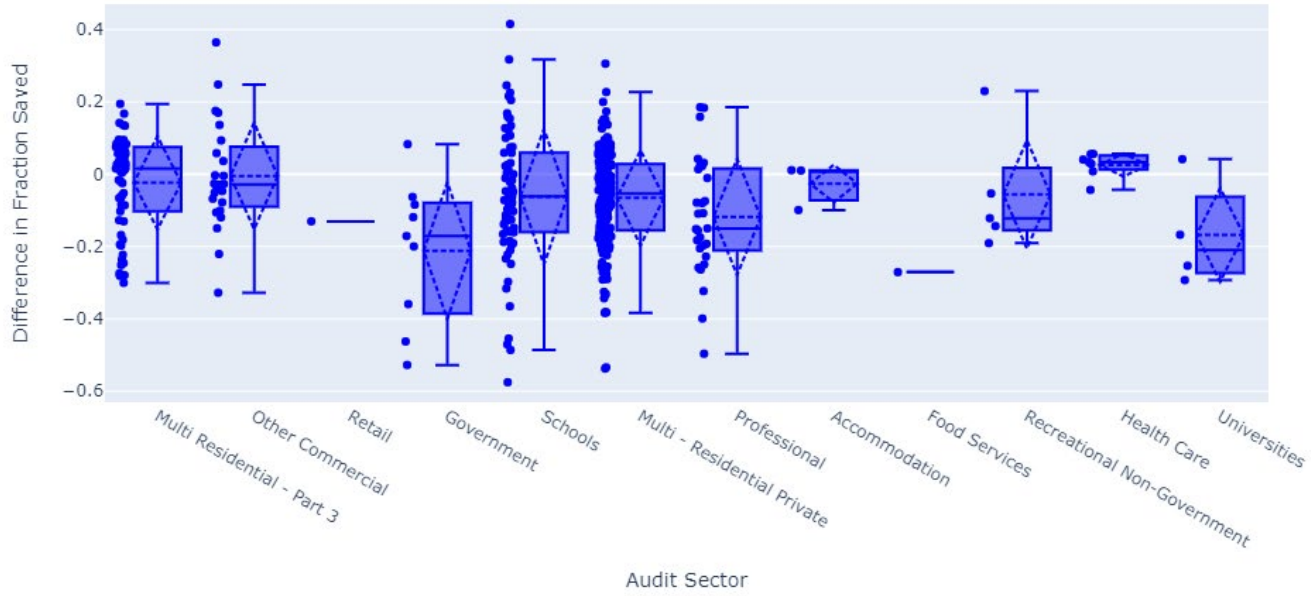
[7] Each eTools version is an update to the modeling software in the form of updates to calculation formulas, default assumptions, weather data, addition of energy saving measures, or bug fixes.

Figure 4-8. Difference in savings by eTools version



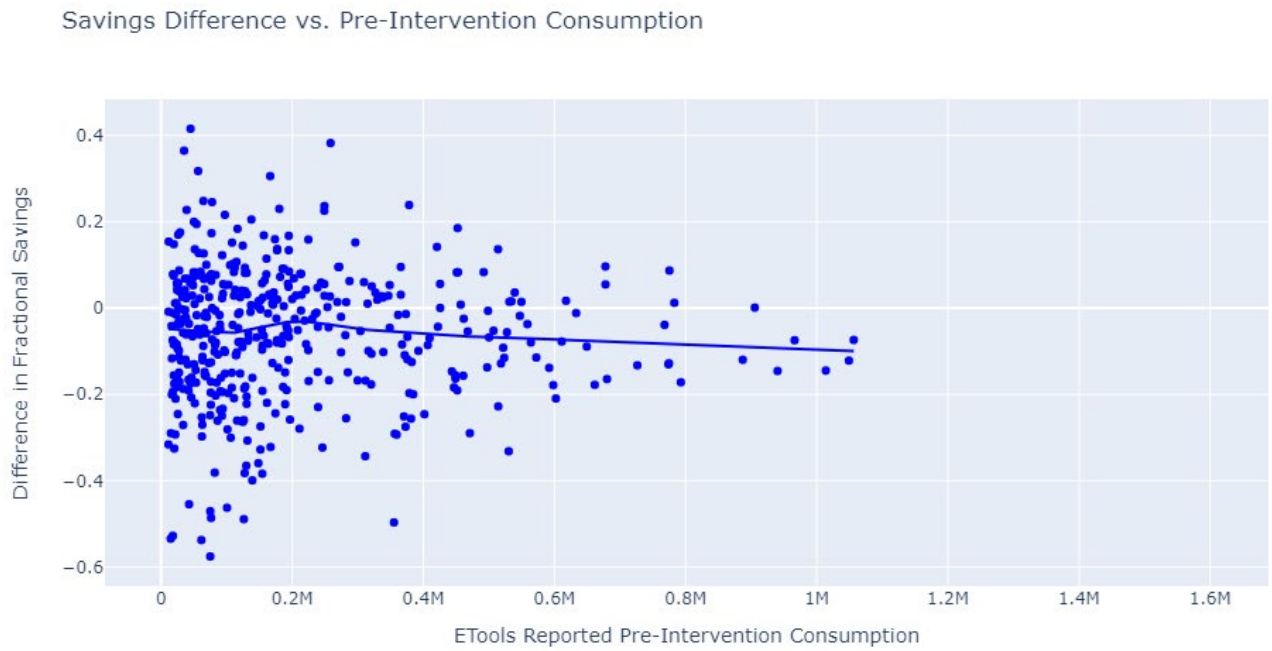
In Figure 4-9, a few Audit Sector categories appear to perform better, on average: Multi-Residential Part 3, Other Commercial, and Health Care. The Health Care category is the only place where eTools appears to underestimate savings, but this is based on only 7 data points, so it could easily be by chance. DNV intends to explore these results extensively in Phase 2 of the project.

Figure 4-9. Difference in savings by audit sector



The LOESS trend line in Figure 4-10 indicates that sites with the greatest pre-program consumption perform worse, on average, than more moderately sized sites. DNV plans to explore these results extensively in Phase 2 of the project.

Figure 4-10. Difference in Savings by pre-intervention consumption



5 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 findings from Phase One of the evaluation are:

- Overall, at most 70% 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 a RR. 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
- Total evaluated pre-project consumption and seasonal pre-project consumption show high correlation with eTools estimates.

- All RRs were estimated with roughly 90/10 precision. While visually there may appear to be limited correlation, the precision of these estimates belies that concern.
- Comparison of eTools and evaluated savings were conducted for various project characteristics (heating end use, eTools version, and facility type) but again 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 One, some eTools projects had “replacement” savings in which “standard” units, standard units are more efficient than existing, were used as the baseline. This was a structural bias in Phase One 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.

Some potential sources of error in the eTools savings include:

- 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.
- Engineering errors related to interactive effects, and additive limitations which could lead to inaccurate savings.

Phase Two is intended, in part, to address the biases from Phase One, the influence of NREs, and the potential sources of error in eTools.

6 NEXT STEPS

DNV intends to continue this investigation to determine whether eTools can be adjusted to more accurately reflect real-world consumption changes using the strategy described next.

6.1 Multivariate Regression Analysis

It is possible that multiple, uncorrelated variables could have different effects on the divergence of eTools estimates from evaluated estimates. In this case, the joint effect of these variables may make any effect difficult to see in a bivariate comparison graph. To explore this possibility, DNV will conduct a multivariate linear regression, including likely causal variables identified above, to see if multiple variables affect the divergence in ways that were not obvious before.

Results from the eTools variable review and multivariate regression analysis will be rolled into an updated version of this memo prior to starting phase 2 (planned as described below).

6.2 eTools Re-Runs

DNV then recommends moving to Phase 2 of the verification. A plan is being developed to migrate older eTools sites into the newest calculator version (e7-00). Re-running older projects in the newest calculator is necessary to ensure results are appropriate to current eTools, rather than muddied by prior versions. Next steps would then include:

1. Integrating identical usage data for billing analysis “pre-“ period into eTools.
   - Pre-period consumption data are not likely the primary source of discrepancies between eTools and evaluation findings. However, eTools uses consumption data to estimate heating load and uses heating load to estimate savings, so it is important that consumption data in the billing analysis are the same as the data used in eTools in order to eliminate one possible reason for the variation between evaluation results and eTools results.
2. Assembling verification reports from previous CPSV evaluations of boilers to identify recurring NREs to be used in the following step.
3. Changing boiler inputs in the calculator to test hypotheses of source of differences. Some possibilities include:
   - Existing boiler efficiency
   - Post-condition water temperature settings (revert to pre-condition)
   - Recurring NREs from verification report findings from previous CPSV of boilers
4. Comparing billing analysis savings to advancement savings from eTools reruns

6.3 Control Group Study

The additional work necessary to refine the current qualitative results, indicating that eTools estimates are statistically greater than billing analysis results, into a quantitative aggregate RR will be identified and pursued. Current potential steps include:

1. Add control group to billing analysis
   - Use billing data for previous program participants (those not included in phase 1 of this study) to build a trend in usage. This controls for some aspects of self-selection, but not all, e.g., NREs correlated with boiler install are not controlled for.
2. Work with EGI to identify non-participants to include in a billing analysis.
   - To get a good match the selection criteria need to be defined:
     - Customer type
     - Location
     - Pre-period consumption magnitude and trend

DNV's professional experience in designing control groups confirms that there will be many logistical challenges in finding a control group in the 2012 to 2018 period that are good matches for the evaluated participants. However, if a control group can be formed, the outcome of this work will be an aggregate RR (not site-specific RRs) which will have controls for consumption trends and NREs to the extent that the comparison group is representative of the evaluated sample. An aggregate RR is one that can be applied to all future eTools boiler projects as many of the structural biases and shortcomings in Phase One will be addressed.

ENBRIDGE GAS INC.

Undertaking Response to School Energy Coalition

Undertaking

Tr: 163

To provide the percentage of cubic metres that were measured using E-Tools in the most recent year available.

Response:

In the 2021 draft results, 15% of net cumulative natural gas cubic metres in the Enbridge Gas DSM portfolio were measured using eTools.

Home Efficiency Rebate Terms and Conditions – June 2021

You, the participant, must review and agree to the following terms and conditions (the "Terms and Conditions") for the Home Efficiency Rebate program delivered by Enbridge Gas Inc. Please note, before you agree to these Terms and Conditions, Enbridge Gas Inc. may change any term including the rebate amount without prior notice. The terms, including the full rebate amount, applicable to you will be those offered at the time of project completion and agreement to these Terms and Conditions. Full terms and conditions including eligibility criteria are available for review at enbridgesmartsavings.com/homerebate

1. Disclosure; Consent To Use Information

As a participant in the Home Efficiency Rebate program, I consent to the collection, use and disclosure of my personal information by Enbridge Gas Inc. for the purposes of administering my participation in the program. Enbridge Gas Inc. may collect and use my personal information for the purposes of reporting on the program, determining eligibility for the program, sending follow-up surveys, conducting studies, audits, evaluations or other verifications related to this program and for such other purposes lawfully permitted by privacy laws. I further understand that my name, mailing address and aggregated savings information may also be shared with my local electricity distributor so that they can contact me about related programs, and with other governmental authorities as permitted by privacy laws. In connection with my participation in the Home Efficiency Rebate program, I understand that Enbridge Gas Inc. may contact me directly, including by email or phone, for the above purposes. If you have any questions or to withdraw your consent, contact Enbridge Gas Inc. by mail attention Privacy Officer at Enbridge Gas Inc. 500 Consumers Rd, North York ON, M2J 1P8

Pursuant to Canada's anti-spam legislation, Enbridge Gas Inc., hereby requests your express consent to contact you at the electronic address or phone number listed in this acknowledgement with information about future conservation programs, or additional Enbridge Gas Inc. programs and services such as paperless billing. Please confirm your consent by signing this document. You may reach Enbridge Gas Inc. by mailing the Privacy Officer at address above.

2. Natural Gas Savings

As a participant, I agree that Enbridge Gas Inc. is entitled to claim the natural gas savings arising out of the Qualifying Measures that receive a rebate from Enbridge Gas Inc. for the purpose of reporting to the Ontario Energy Board.

3. Evaluation, Monitoring and Verification; Audit

As a participant, I agree upon request by Enbridge Gas Inc. or its authorised program delivery agents to participate in any survey, studies, audits, evaluations or verifications conducted by Enbridge Gas Inc. or its authorised program delivery agents in connection with the Home Efficiency Rebate program, including for the purposes of the proper administration, other program participation (as noted in Section 6 below), monitoring and verification of these Terms and Conditions or evaluation of the program, and will provide to them reasonable access to participant records and facilities for such purposes.

4. Provision of Products and/or Services by Others

A registered energy advisor ("REA") may offer, or refer me to contractors that can offer, energy efficiency products and/or services, including Qualified Measures. I understand and acknowledge that the provision and installation of these products and/or services is unrelated to the Home Efficiency Rebate program and I am under no obligation to proceed/purchase the products or services offered by any REA or REA-referred contractor. Enbridge Gas Inc. is not affiliated with nor does it endorse or recommend any products and/or services offered by any REA or REA referred contractor. Additionally, Enbridge Gas Inc. does not make any warranty for the suitability and use of these products and or services, and it shall not be held responsible for any claim, damage, direct or indirect, special or consequential incurred by the use of the product and/or service offered by any REA or REA referred contractor.

5. Indemnity

As a participant in the Home Efficiency Rebate program, I certify that I will (i) indemnify and save harmless each of the partners in delivering this program and their respective directors, officers and employees from any and all liability and all claims, losses, damages (including indirect or consequential damages), expenses and proceedings for personal injury (including death) or property damage of any person relating to, in connection with, resulting from, or arising out of the initiative or any other matter contemplated by these Terms and Conditions and (ii) hereby release and forever discharge Enbridge Gas Inc., from any and all manner of action and inaction, cause or causes

of action, suits, debts, dues, sums of money, claims and demands whatsoever at law or in equity arising out of, or which are in any way related to, the initiative or any other matter contemplated by these Terms and Conditions.

6. Other Program Participation

I certify that I have not applied for, nor will apply in the future for, rebates from the Canada Greener Homes Grant, other government programs or similar programs for the same qualifying energy efficiency improvements for which I will apply to receive rebates through this Home Efficiency Rebate program. For further clarity, I have not and will not apply for rebates for the same home energy assessment costs, heating system, water heating system, insulation upgrades, air sealing or the same windows or doors.

I agree that Enbridge Gas Inc. can share the information I provide under this program with other organizations for purposes of determining my eligibility for a rebate.

Participant Initials: _____

7. Miscellaneous

Except as otherwise provided, these Terms and Conditions constitute the entire agreement between you and Enbridge Gas Inc., in connection with its subject matter and supersede all prior representations, communications, negotiations and understandings, whether oral, written, express or implied, concerning the subject matter of these Terms and Conditions. These Terms and Conditions may not be varied, amended or supplemented except by an agreement by Enbridge Gas Inc. These Terms and Conditions will be governed by and construed in accordance with the laws of the Province of Ontario and the federal laws of Canada applicable therein. These Terms and Conditions will enure to the benefit of and are binding upon you and Enbridge Gas Inc. and the respective successors and permitted assigns of you and Enbridge Gas Inc. These Terms and Conditions will not be assigned by you to another person. You will, from time to time, on written request by Enbridge Gas Inc., do all such further acts and execute and deliver or cause to be done, executed and delivered all such further things as may be reasonably required in order to fully perform and to more effectively implement these Terms and Conditions. The invalidity, unenforceability or illegality of any provision in these Terms and Conditions will not, to the extent permitted by applicable law, affect the validity, enforceability or legality of any other provision of these Terms and Conditions, which will remain in full force and effect. The insertion of headings is for convenience of reference only and will not affect the interpretation of these Terms and Conditions. The terms “hereof”, “hereunder”, and similar expressions refer to these Terms and Conditions and not to any particular section or other part of these Terms and Conditions. The word “including” means “including without limitation”, and the words “include” and “includes” have a corresponding meaning.

Participant name: (please print)	_____	Phone #:	_____
Signature:	_____	Email:	_____
Account #	_____	Date:	_____
Service Organization:	_____	File #:	_____
Energy Advisor Name:	_____		
Energy Advisor Signature:	_____	Date:	_____

ENBRIDGE GAS INC.

Undertaking Response to OEB Staff

Undertaking

Tr: 7

To file the Participation Agreement.

Response:

The Participation Agreement is provided at Attachment 1 to this undertaking.

ENBRIDGE GAS INC.

Undertaking Response to OEB Staff

Undertaking

Tr: 46

To confirm that during the 2012 to 2014 DSM term Enbridge did not have a target adjustment mechanism.

Response:

For the 2012-2014 DSM Plan term in the Union Gas rate zones, the targets were as follows:

- For the Resource Acquisition and Large Volume scorecards:
  - 2012 targets were fixed since it was the first year of the Plan term, however 2013 and 2014 did have the target adjustment mechanism, similar to the target adjustment mechanism in place today.
- Low Income and Market Transformation targets were fixed for 2012-2014

For the same 2012-2014 DSM Plan term in the Enbridge Gas rate zone there was no target adjustment mechanism.

ENBRIDGE GAS INC.

Undertaking Response to OEB Staff

Undertaking

Tr: 49

To advise as to whether or not Enbridge's position is that there were more new programs introduced in the current plan as compared to the 2015-2020 plan.

Response:

Given that the 2015-2020 plans were separate and distinct for each of the two pre-amalgamation utilities this is an apples and oranges comparison. Also of note, several program offerings proposed by the utilities in the 2015-2020 DSM plan period were not ultimately approved by the OEB.

It is Enbridge Gas's position that the current plan proposal encompassing integrated DSM delivery for the single amalgamated utility effectively incorporates a full array of programming aimed at ensuring DSM participation is afforded to the Company's full range of customers.

The proposed program offerings have been updated to some degree and a number of program offerings are completely new. A few program offerings previously delivered in the 2015-2020 have not been proposed to continue due to changes in the market or based on an assessment of their success. Of note, combining program offerings between the utilities introduces a degree of uncertainty as assumptions needed to be made. For example, for the commercial custom program offering, this is not a new program offering, however there are updates such as a new single set of net to gross values for the combined utility that has been proposed. In other words, virtually all the proposed program offers have some degree of change.

ENBRIDGE GAS INC.

Undertaking Response to Green Energy Coalition

Undertaking

Tr: 213

Mr. Weaver to provide a graphic showing five-, ten- and 16-year amortizations with ramp-ups included, starting with a 10 percent ramp-up from 2022 to 2023.

Response of Mr. Weaver (First Tracks):

See graphics below.

Figures 1-4 assume amortized DSM expenses are treated like expenses for tax purposes, and that the first-year tax benefit reduces first-year revenue requirements. See spreadsheet “J4.5_Enbridge_Amortization_TaxAsXpense” for calculations.

Figures 5-8 assume amortized DSM expenses are treated like expenses for tax purposes, and that the first-year tax benefit reduces the size of the created regulatory asset. See spreadsheet “J4.5_Enbridge_Amortization_TaxAsXpense Option 2” for calculations.

All figures show revenue requirements for a “ramp-up” level of expenditures, with 2023 expenditures set to 10% above Enbridge’s proposed 2023 budget, and 2024-2027 expenditures increased from the previous year by 20%. After 2027, expenditures increase at 2% per year to reflect projected inflation.

Figure 1 shows ramp-up revenue requirements under amortization for 5-year, 10-year and 16-year amortization terms (three sets of bars in the chart), and compares them to the ramp-up revenue requirement under expense treatment (blue line). For comparison, Figure 1 also shows Enbridge’s proposed expenditures under expense treatment.

Figures 2-4 shows the same data but limits the information to one amortization term in each graph.

Figures 5-8 show similar information but uses the assumption that first year tax benefits reduce the size of the created regulatory asset.

Figure 1: Tax Benefit Reduces First-Year Revenue Requirement, All Scenarios

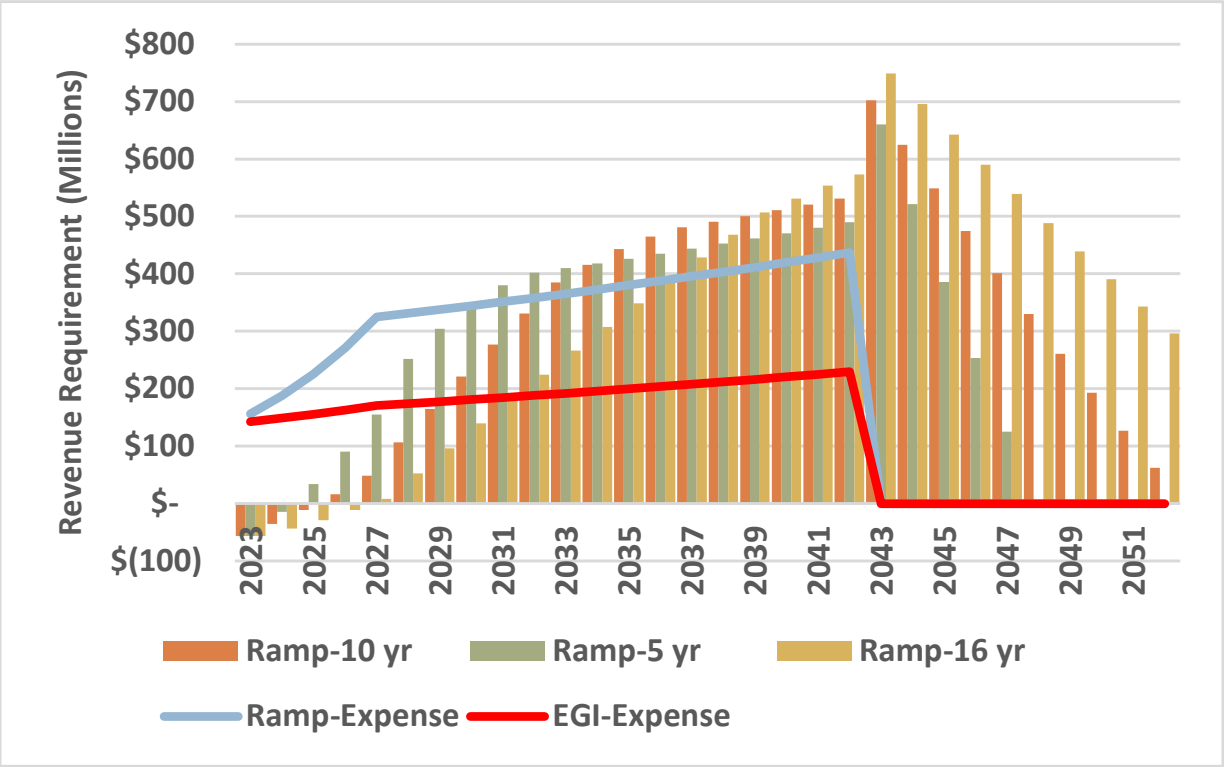


Figure 2: Tax Benefit Reduces First-Year Revenue Requirement, 10-Year Term

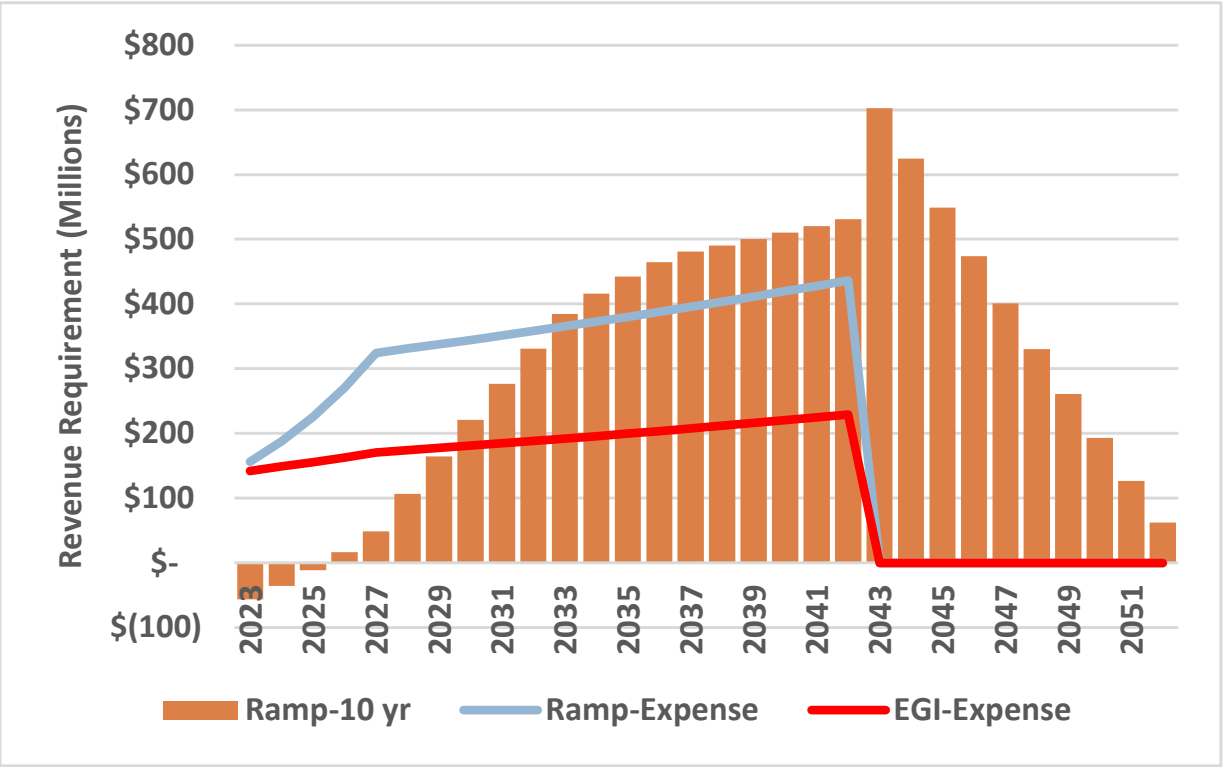


Figure 3: Tax Benefit Reduces First-Year Revenue Requirement, 5-Year Term

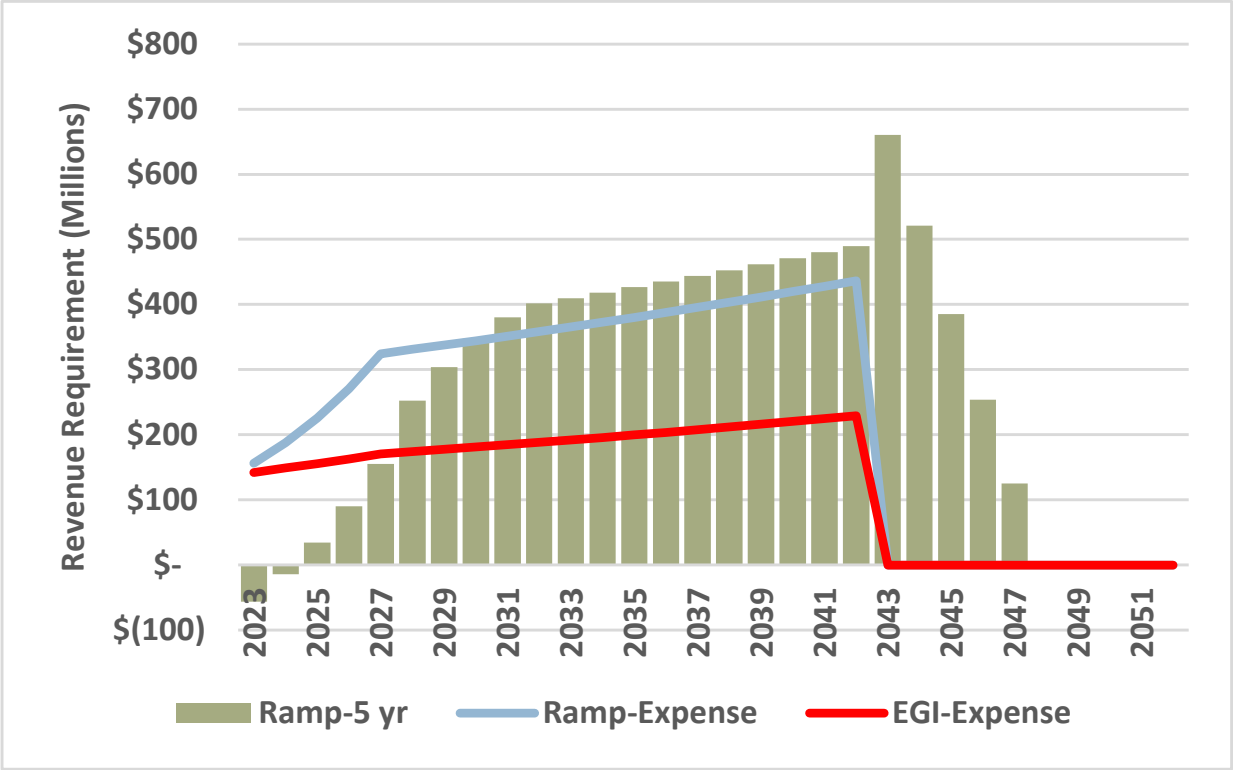


Figure 4: Tax Benefit Reduces First-Year Revenue Requirement, 16-Year Term

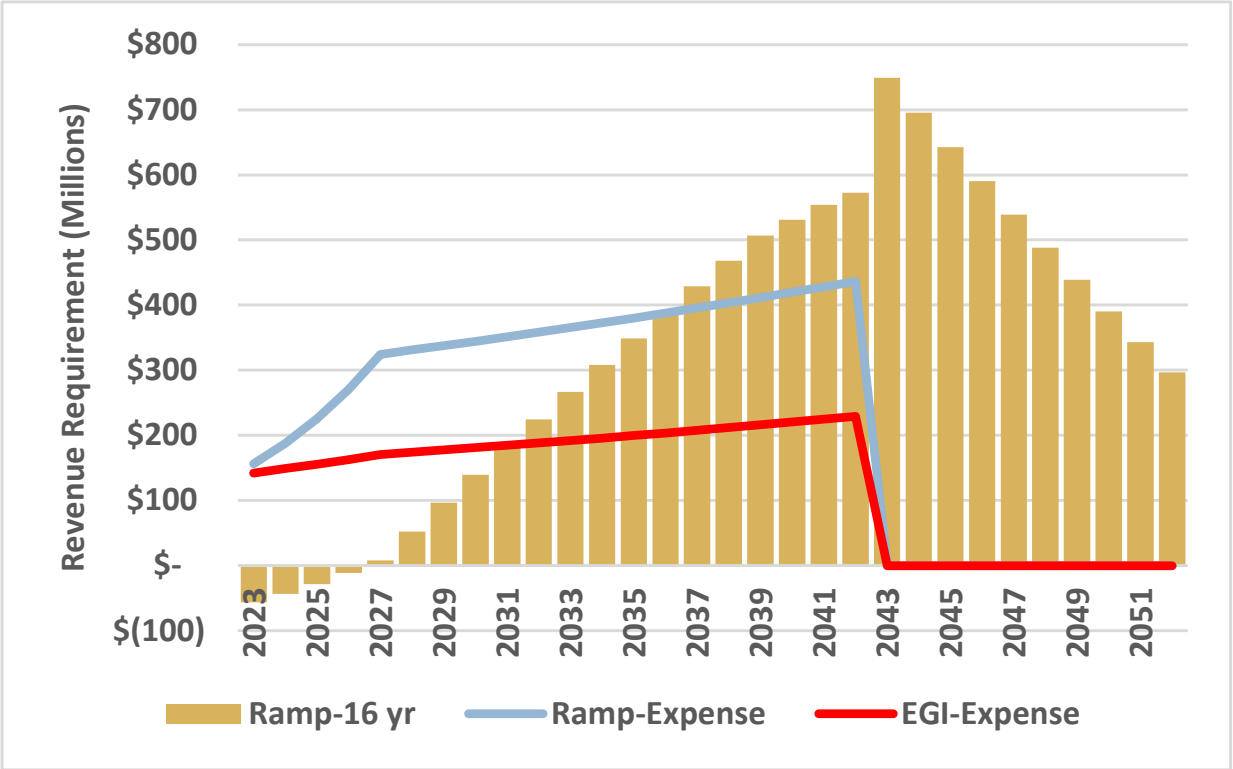


Figure 5: Tax Benefit Reduces Size of Regulatory Asset, All Scenarios

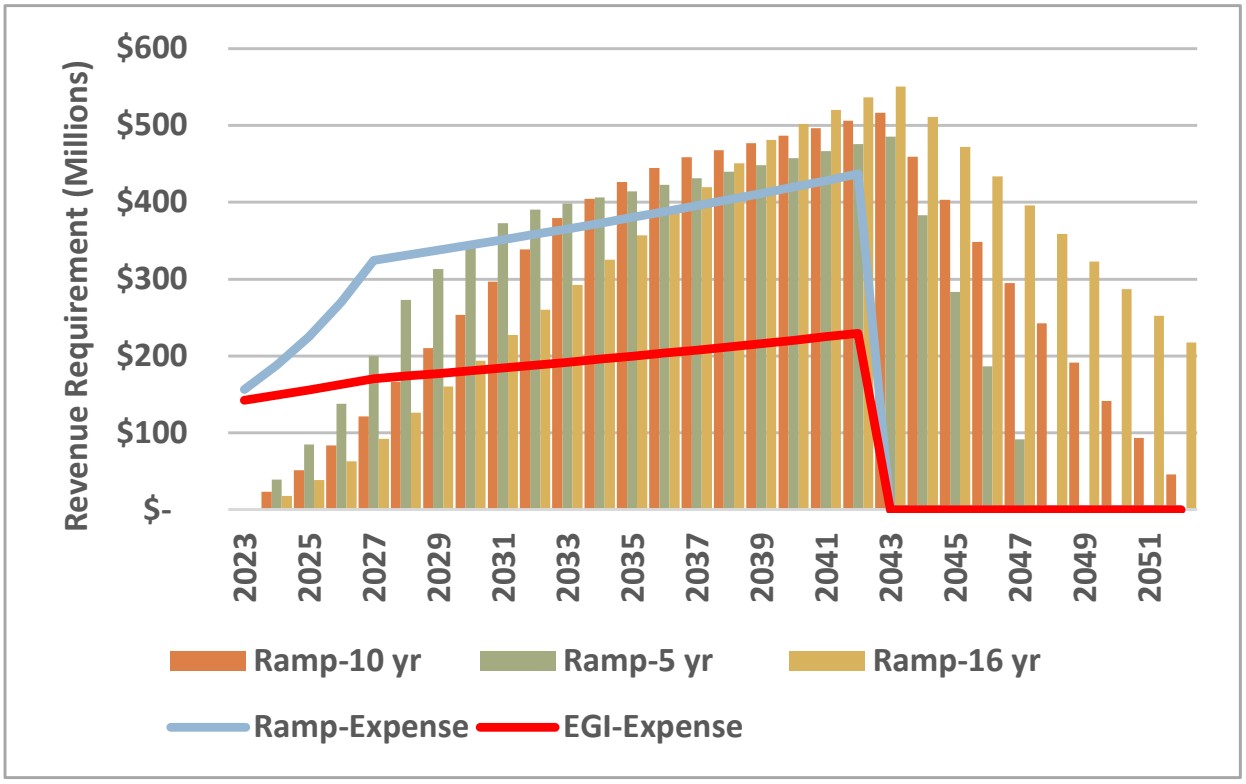


Figure 6: Tax Benefit Reduces Size of Regulatory Asset, 10-Year Term

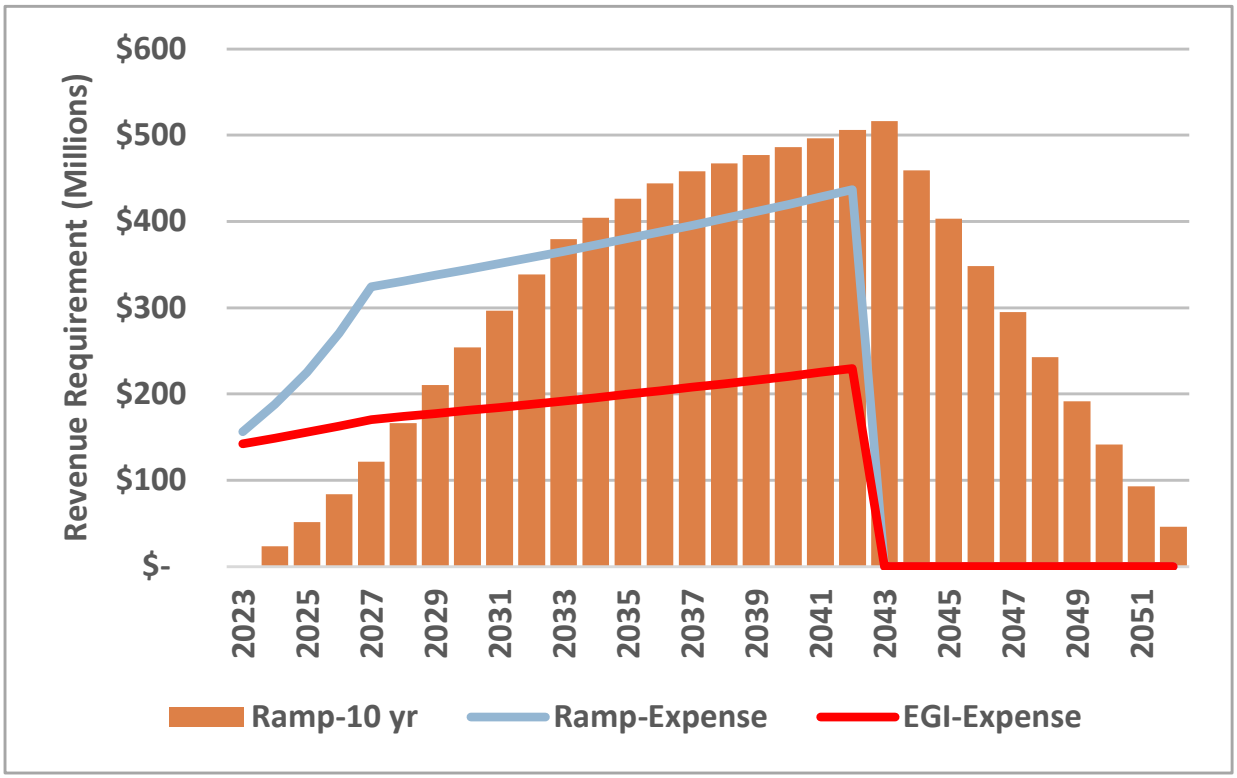


Figure 7: Tax Benefit Reduces Size of Regulatory Asset, 5-Year Term

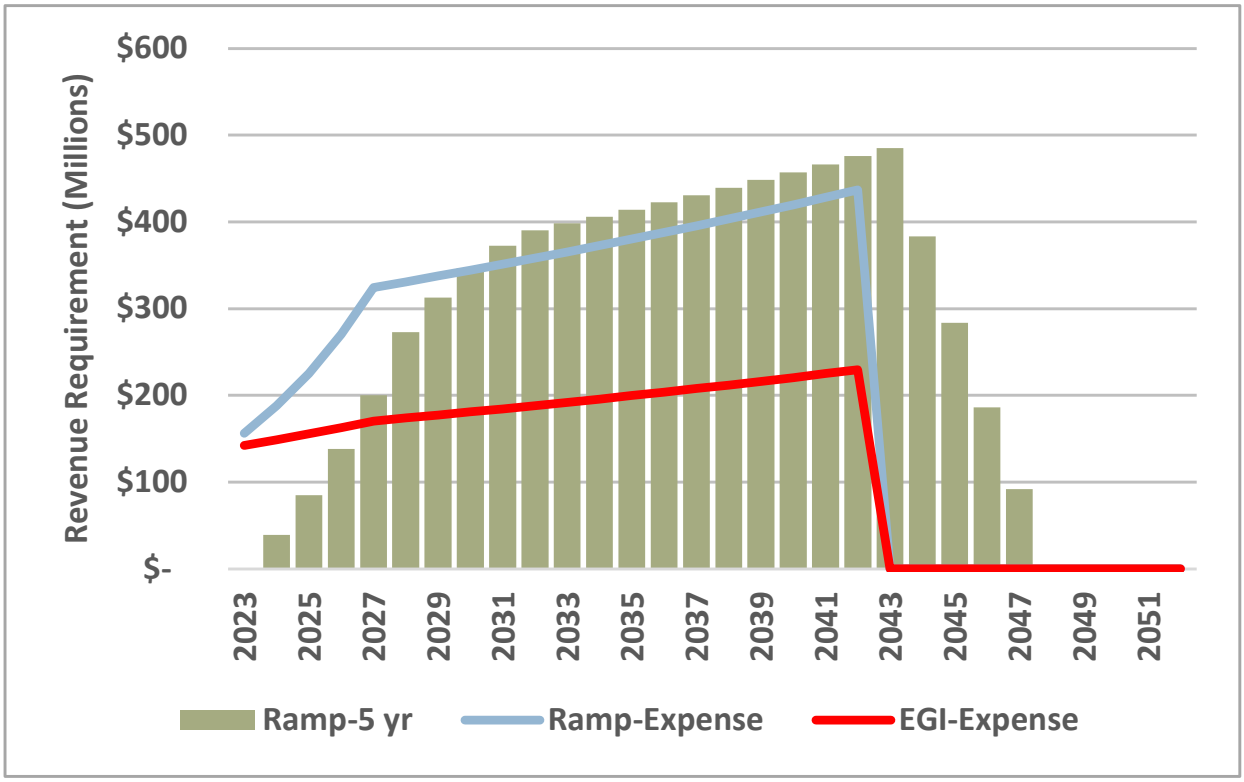


Figure 8: Tax Benefit Reduces Size of Regulatory Asset, All Scenarios