April 6, 2018

BY EMAIL, COURIER & RESS

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
Suite 2700, 2300 Yonge Street
Toronto, Ontario
M4P 1E4

RE: EB-2017-0323 – Union Gas Limited – 2015 DSM Deferral Disposition
- Interrogatory Responses

Dear Ms. Walli,

On December 18, 2017 Union Gas Limited ("Union") filed an application for an order of the Ontario Energy Board ("OEB" or the "Board") seeking approval to dispose of 2015 balances in its Demand Side Management ("DSM") deferral and variance accounts.

Pursuant to the OEB's Procedural Order No. 1 dated February 26, 2018 please find attached Union's responses to written interrogatories. These responses will be delivered to parties by email, will be filed on the OEB's RESS, and copies will be sent by courier to the OEB.

As stated in Union's response at Exhibit B.GEC.1, a live Excel spreadsheet has been provided to the requesting party via email, copying the OEB. Other parties who wish to receive a copy of the document can contact Union directly.

The responses beginning at Exhibit B.SEC.37 through to Exhibit B.SEC.51 were provided by Navigant Consulting, Inc.

If you have any questions with respect to this submission please contact me at 519-436-4558.

Yours truly,

[original signed by]

Adam Stiers
Manager, Regulatory Initiatives

Encl.

cc: Myriam Seers, Torys
Valerie Bennett, OEB Case Manager
EB-2017-0323 Intervenors

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 1, p. 4
Exhibit A, Tab 2, p. 21

Preamble: Union Gas states: Examples of such shortfalls in the EM&V process began at the outset when the independent third-party consultant DNV GL was hired to be the EC without any Evaluation Advisory Committee ("EAC") member consultation or consideration.

And

Union Gas states: In April 2016, the EC was hired without input from EAC members to audit the utilities' full 2015 DSM program portfolio without any EAC consultation.

Question:

a) In the August 21, 2015 letter from the OEB to DSM stakeholders, as referenced at Exhibit A, Tab 2, p. 4 of Union Gas' application, the OEB states that the role of OEB is to include, amongst other responsibilities, "…selecting a third party Evaluation Contractor (the EC)." Please describe how OEB Staff's selection of DNV GL (the EC) without EAC or utility input was not appropriate.
b) Please confirm whether or not all members of the EAC were invited to provide input on the RFP's Scope of Work used to procure the EC to evaluate the 2015 program year.
c) Please confirm whether or not all members of the EAC were invited to provide input on the Scopes of Work used to procure other supporting evaluation contractors for the 2016 and 2017 program years.

Response:

a) As per the August 21, 2015 letter from the OEB, the role of the EAC is to *"provide input and advice to the OEB on the evaluation and audit of DSM results."*[1] The review of prospective bidder proposals and workplans, total proposed budgets, reasons for selecting a winning bidder and the EC contract together with the ultimate selection of an EC are critical components of the EM&V process. Despite this, OEB Staff did not involve the EAC in these reviews, and OEB Staff did not provide these materials for comment in advance of making its decision on an EC. This is inappropriate considering the advisory role of the EAC defined by the OEB as noted above.

[1] EB-2015-0245, OEB Letter, August 21, 2015, p. 2

Excluding the EAC from the EC selection process is a step backward compared to the level of collaboration and transparency seen in the 2012-2014 DSM Framework which included an auditor (now the EC) and Audit Committees (now the EAC). The auditor selection process has historically been a collaborative effort where all members of the utilities' respective Audit Committees endeavoured to reach consensus. As noted in the Stakeholder Engagement Terms of Reference ("Terms of Reference"), ultimately the intervenor members would choose an auditor in the event that consensus was not reached. Having this clarity within the Terms of Reference enabled an efficient auditor selection process without any undue delay. This process acknowledged the benefits of leveraging the experiences and expertise of the Audit Committee. It also helped ensure that Audit Committee members supported the evaluation approach proposed by the auditor prior to the initiation of EM&V activities rather than later in the process.

b) Confirmed.

c) Confirmed.

However, as was the case in 2015, the EAC was not provided with prospective bidder proposals and workplans, total proposed budgets, and reasons for selecting a winning bidder for the procurement of the ECs for the 2016 and 2017 program years. As noted in part a) above, the role of the EAC is to *"provide input and advice to the OEB on the evaluation and audit of DSM results."* Not involving the EAC in these reviews, and not providing these materials for comment in advance of making a decision on an EC is inappropriate considering the advisory role of the EAC defined by the OEB as noted above.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 1, p. 5

Preamble: Union Gas states: The approximate one year delay of the EM&V results is excessive and is in part due to the prolonged time taken to finalize the EM&V Plan, and excessive project sampling relative to prior audits for the 2015 Custom Project Savings Verification ("CPSV") Process.

Question:

a) Related to the 2015 EM&V process, please indicate when OEB staff provided Union Gas with the non-disclosure agreement (NDA) for signature for Union to release data required for evaluation activities, and when Union returned the signed document to OEB staff and DNV GL.
b) Please indicate the length of time Union required to fulfill all data requests made by the EC to facilitate the evaluation of Union's DSM programs. Please specify the date that the last set of data was provided to the EC.
c) Please indicate whether or not Union Gas was provided with an opportunity to review/provide input on all major deliverables of the evaluation project. If yes, please indicate, in total, the amount of days Union Gas was provided for this review.

Response:

a) OEB Staff did not provide Union with an NDA for signature. Union interprets this question to refer to the Confidentiality Declaration and Undertaking document that OEB Staff presented to Union for execution in a letter from OEB Staff on February 10, 2017. Union executed and returned this document on February 16, 2017.

b) All EC requests for data up to the completion of the EC's Final Audit Report on October 16, 2017 (revised December 20, 2017) are provided in Table 1 below. This table does not include requests for qualitative information or written comments on work products, which are included in response to part c) below. The last set of data was provided on September 12, 2017, which was unsolicited and resulted in a 40% increase to correct the EC's verified LRAM amount. For illustrative purposes, Table 1 also indicates the additional business days Union required to deliver the requested data.

   Many of the EC's due dates were assigned to Union without any advanced consultation. As a result, in limited instances, Union required additional time beyond the EC's due dates. In such instances, the data requests were large and the timelines were unreasonable. The additional 19 business days needed to provide data did not have a material impact on the

EM&V process, which took more than 800 days from initial EC RFP draft on November 13, 2015 to the EC's Final Audit Report on December 20, 2017.

Table 1

Data Description	**Date of Request**	**EC Due Date**	**Date Provided**	**Additional Business Days Required to Deliver Requested Data**
2013-2015 Custom Project Information for Net-to-Gross	Not Recorded	Not Recorded	Mar 15, 2016[1]	Not Applicable
Custom 2015 Project Files Examples and Low Income data	Requested during Jun 2016 EAC call recognizing that data could not be provided until NDA executed. NDA executed Aug 16, 2016.	Not Recorded	Aug 17, 2016	Not Applicable
Custom 2015 Project Titles and Descriptions	Not Recorded	Not Recorded	Sep 9, 2016	Not Applicable
CPSV/NTG Bin 1 (Initial sites)	Nov 8, 2016	Nov 18, 2016	Nov 18, 2016	On Time
Bin 2 (remaining CPSV Sample)	Nov 8, 2016	Nov 25, 2016	Nov 28, 2016	1 additional business day required
Bin 3 (remaining FR sample and backup)	Nov 8, 2016	Dec 2, 2016	Dec 13, 2016	7 additional business days required
Bin 4 (Spillover sample)	Nov 8, 2016	Original date of Dec 9, 2016 but deferred by OEB Staff until Feb 21, 2017[2]	Feb 22, 2017	1 additional business day required

[1] Approximate date
[2] As indicated in a schedule update provided by OEB Staff on January 30, 2017, delivering spillover tracking data was designated a "low" priority with a new deadline of February 21, 2017.

Data Description	**Date of Request**	**EC Due Date**	**Date Provided**	**Additional Business Days Required to Deliver Requested Data**
Ontario Gas Portfolio Data Request	Jan 6, 2017 EC memo	Jan 20, 2017	Jan 23, 2017	1 additional business day required
2015 Annual Verification: Data Collection Round 2	Jan 31, 2017 EC email	Feb 14, 2017	Feb 16, 2017[3] Feb 17, 2017 Feb 27, 2017	2 and 9 additional business days required[4]
Prescriptive Measure Questions: Round 1	Mar 3, 2017 EC email	None Provided	Mar 9, 2017	Not Applicable
Prescriptive Measure Questions: Round 2	Mar 24, 2017 EC email	None Provided	Mar 31, 2017	Not Applicable
Low Income Weatherization HOT2000 Verification Questions: Round 2	Mar 24, 2017 EC email	None Provided	Apr 3, 2017	Not Applicable
Home Reno Rebate HOT2000 Verification Questions: Round 2	Mar 24, 2017 EC email	None Provided	Apr 3, 2017	Not Applicable
Custom Greenhouse Project Assumptions	Mar 27, 2017 EC email	None Provided	Apr 5, 2017	Not Applicable
Avoided Cost Questions	Apr 12, 2017 EC email	None Provided	Apr 19, 2017	Not Applicable

[3] All data provided February 16, 2017 with the exception of Home Weatherization Program ("HWP") offering data. HWP data was sent February 17, and February 26, 2017.
[4] For HWP only.

Data Description	**Date of Request**	**EC Due Date**	**Date Provided**	**Additional Business Days Required to Deliver Requested Data**
Steam Trap Equation Questions	Apr 18, 2017 EC email	None Provided	Apr 19, 2017	Not Applicable
Questions on Union Influence Adjustment Factor	Apr 20, 2017 EC email	None Provided	May 2, 2017 May 12, 2017	Not Applicable
Dock Door Seals Savings Adjustment Questions	May 8, 2017 EC email	None Provided	May 15, 2017	Not Applicable
Home Reno Rebate HOT2000 Verification Questions: Round 3	Jun 5, 2017 EC email	None Provided	June 8, 2017	Not Applicable
ESK Verification Questions	Jun 27, 2017 EC email	None Provided	Jun 29, 2017	Not Applicable
Residential Deep Savings Participants Question	Jul 10, 2017 EC email	None Provided	Jul 11, 2017	Not Applicable
ESK Verification Questions: Round 2	Jul 11, 2017 EC email	None Provided	Jul 11, 2017	Not Applicable
LRAM Calculation Support	Jul 20, 2017 EC email	None Provided	Jul 20 2017	Not Applicable
Scorecard Derivation Request	Aug 15, EAC meeting	None Provided	Aug 23, 2017	Not Applicable
Flagging of EC's Errors in Calculating Union's Audited LRAM Amounts	Not Requested	Not Applicable	Aug 25, 2017 Sep 12, 2017	Not Applicable

c) Union interprets major deliverables to refer to items marked as OEB and/or EC Major Deliverables in the EC RFP. These items are detailed in Table 2 below. Union was given the opportunity to review and to provide input on all major deliverables with the exception of the hiring of the verification consultant. For illustrative purposes, the table also indicates the difference between the major deliverable expected due date and delivery date.

Union and all EAC members were provided a total of 115 business days to review all major deliverables. This corresponds to an average of 9 business days per major deliverable. In contrast, the EC required on average an additional 12 months to complete its major deliverables beyond what was originally proposed.

Table 2

Major Deliverable	Party Responsible for Major Deliverable	Date Major Deliverable was Expected as per EC RPF	Date Major Deliverable was Presented to the EAC for Comment	Due date for EAC Comments on Major Deliverable	Date Union Provided Comments	Number of Business Days Provided for EAC Comment	Date of Delivery of Final Major Deliverable	Additional Time Required to Finalize Major Deliverable
EM&V Plan	OEB/EC	Apr 2016	Sep 16, 2016	Sep 30, 2016	Sep 30, 2016	11 days	Feb 2, 2017	10 months
Verification Consultants Hired	OEB	Apr 2016	Not provided to EAC for comment	Not Applicable	Not Applicable		May 2016 (DNV GL was hired as both the EC and the verifier)	Not Applicable
CPSV Verification Reports	EC	Jul 2016	Batch 1 (*mid Feb 2017)	*Mar 3 2017	*Mar 3 2017	13 days	*Jun 1 2017	11 months
			Batch 2 (*late Feb 2017)	*Mar 6 2017	*Mar 6 2017	5 days		
			Batch 3 (*Mar 13, 2017)	Mar 20 2017	Mar 20 2017	6 days		
			Batch 4 (*Mar 20, 23, & 27 2017)	Mar 30, 2017	Mar 30, 2017	9, 6 & 4 days		
			Batch 5 (*Apr 5, & 10 2017)	Apr 12, 2017	Apr 11, 2017	6 & 3 days		
			Batch 6 (*Apr 14, 20 & 24 2017)	Apr 26, 2017	Apr 27, 2017	9, 5 & 3 days		
			Batch 7 (*May 1, 2, & 3 2017)	May 8, 2017	May 8, 2017	6, 5 & 4 days		
OEB Draft DSM Results Report (i.e. draft audit report)	OEB/EC	Sept 2016	Jul 26, 2017	Aug 9, 2017	Aug 9, 2017	11 days	Not Applicable – see below	1 year and 1 month

Major Deliverable	Party Responsible for Major Deliverable	Date Major Deliverable was Expected as per EC RPF	Date Major Deliverable was Presented to the EAC for Comment	Due date for EAC Comments on Major Deliverable	Date Union Provided Comments	Number of Business Days Provided for EAC Comment	Date of Delivery of Final Major Deliverable	Additional Time Required to Finalize Major Deliverable
OEB Final DSM Results Report (i.e. final audit report)	OEB/EC	Oct 2016	First version of final report provided Sep 11, 2017.	No EAC comment period was provided	Sep 12, 2017	Not Applicable	Dec 20, 2017	1 year 2 months
Updated TRM		Nov 2016	Dec 11, 2017	Dec 15, 2017	Dec 15, 2017	5 days	Dec 22, 2017	1 year 1 month

*Approximate date

In addition to the above, Union considers the CPSV/NTG Scope of Work, CPSV/NTG (Free Ridership only) Results Report and Spillover Report as major EC deliverables. These items are detailed in Table 3 below.

Table 3

Major Deliverable	Party Responsible for Major Deliverable	Date Major Deliverable was Expected	Date Major Deliverable was Presented to the EAC for Comment	Due Date for EAC Comments on Major Deliverable	Date Union Provided Comments	Number of Business days Provided for EAC Comment	Date of Delivery of Final Major Deliverable	Time Between Expected Delivery Deadline and Actual Delivery
CPSV/NTG Scope of Work	OEB/EC	NA	Oct 8, 2016	Oct 18, 2016	Oct 18, 2016	7 days	Dec 14, 2016	NA
CPSV/NTG (FR only) Results Report	OEB/EC	*Oct 2016	May 24, 2017	Jun 14, 2017	Jun 14, 2017	16 days	Aug 15, 2017	10 months
CPSV Spillover Report	OEB/EC	*Oct 2016	Feb 2, 2018	Feb 16, 2018	Feb 16, 2018	11 days	TBD	TBD

*Expected to be included as part of the OEB Final DSM Results Report (i.e. final audit report)

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 1, p. 6

Preamble: Union Gas states: In accordance with Union's recommendations above, Union's 2015 audit adjusted DSM results include OEB-approved 2014 NTG adjustment factors. These results are presented at Exhibit A, Tab 3, Appendix A, Schedule 1. Union requests that the OEB approve the 2015 audit adjusted results as presented on the basis of the arguments summarized above and described in further detail herein. Table 2 below provides Union's 2015 pre-audit, audited, and audit adjusted amounts for comparison. Union's 2015 audited DSM results are presented at Exhibit A, Tab 3, Appendix B, Schedule 1.

Table 2
2015 DSM Results ($ Millions)

	2015 Pre-Audit	**2015 Audited Results**	**2015 Audit Adjusted Results**
LRAM	$0.613	$0.602	$0.617
DSMVA	($0.195)	($0.195)	($0.195)
DSMIDA	$7.548	$7.040	$7.472
TOTAL	$7.966	$7.447	$7.895

Question:

a) Please confirm that the term "Audit" refers to the Evaluation, Measurement, & Verification (EM&V) results reported in DNV GL's EC report, as defined in the 2015-2020 DSM Guidelines and noted in other areas of Union's application.
b) Please describe the various drivers of the variance (e.g., the use of differing NTG ratios, per unit savings assumptions, etc.) between the shareholder incentive calculated by Union ($7.472 million) and that calculated by the EC ($7.040 million).
c) Please describe the various drivers of the variance (e.g., the use of differing NTG ratios, per unit savings assumptions, etc.) between the lost revenue calculated by Union ($0.617 million) and that calculated by the EC ($0.602 million).
d) On a program-by-program basis, please demonstrate the dollar value of each variance driver in b) and c) as well as the process used by Union to calculate the value.
e) Within Table 2, Union indicates that the "2015 Audited Results" include that the value of Union's DSMVA is ($0.195). Please clarify whether or not the EC provided an opinion on the value of Union's DSMVA.
f) Please indicate whether the NTG ratios Union used to calculate its shareholder incentive and lost revenue include spillover.

Response:

a) Confirmed.

b) & c)

The drivers of the variance between the shareholder incentive and lost revenue calculated by Union ($7.472 million and $0.617 million, respectively) and the shareholder incentive and lost revenue calculated by the EC ($7.040 million and $0.602 million, respectively) are the Free Rider rate and Spillover values used. The EC adopted a deemed Spillover value from another jurisdiction to establish its DSMI and LRAM. Please see Table 1 below for detail on these differences.

Table 1

NTG strata as defined by the EC	EC Free Rider rate*	EC Spillover rate	Union Free Rider rate	Union Spillover rate
Custom Commercial & Institutional Buildings-Banner projects	59.4875861613878%	3.4%	54%	0%
Custom Commercial & Institutional Buildings-Contrax projects	55.5752365045723%	3.4%	54%	0%
Custom Agriculture & Greenhouse-Banner projects	62.6919985626682%	3.4%	54%	0%
Custom Agriculture & Greenhouse-Contrax projects	58.7836857460643%	3.4%	54%	0%
Custom Industrial-Banner projects	70.7516474681682%	3.4%	54%	0%
Custom Industrial-Contrax projects	59.9631861363962%	3.4%	54%	0%
Custom Large Industrial R100 projects	91.82603617511760%	3.4%	54%	0%
Custom Large Industrial T1 projects	90.875370580202480%	3.4%	54%	0%
Custom Large Industrial T2 projects	92.328639986915410%	3.4%	54%	0%
Custom Low Income projects	5.0%	0%	5%	0%

** The EC did not round the Free Rider rates it used to calculate findings. The full values as presented in Table 1 are needed to recreate 2015 Audited Results*

d) The dollar variance per program of Union's shareholder incentive is provided in Table 2 below:

Table 2

2015 DSM Program	EC Shareholder Incentive	Union Shareholder Incentive	Variance
CI	$4,010,638*	$4,443,225	$432,587
Residential			
Low-Income	$2,462,534	$2,462,534	$0
Large Volume	$0	$0	$0
Market Transformation	$566,721	$566,721	$0
Total	**$7,039,894**	**$7,472,481**	**$432,587**

** The shareholder incentive is calculated on a scorecard basis rather than on a program basis. The CI and Residential programs are both on the Resource Acquisition scorecard and the shareholder incentive amount cannot be meaningfully divided into programs. The variance of $432,587 is attributed entirely to a variance within the CI Program custom offering.*

The dollar variance per program of Union's lost revenue amount is provided in Table 3 below:

Table 3

2015 DSM Program	EC Lost Revenue	Union Lost Revenue	Variance
CI	$150,561	$155,467	$4,906
Residential	$0	$0	$0
Low-Income	$91	$91	$0
Large Volume	$3,716	$14,319	$10,603
Market Transformation	$0	$0	$0
2015 lost revenue contribution	**$154,368**	**$169,877**	**$15,509**
Pre-2015 lost revenue contribution	$447,600	$447,600	$0
Total	**$601,968**	**$617,477**	**$15,509**

EC Shareholder Incentive and Lost Revenue Scenario – To establish the EC shareholder incentive and lost revenue, Union used the Free Ridership and Spillover values reported by the EC (see Table 1 above) to calculate shareholder incentive and lost revenue amounts and confirmed that they align with the amounts reported by the EC. Please see the response at Exhibit B.GEC.1.Attachment A for the EC's shareholder incentive calculator. Union did not receive the EC's lost revenue calculator.

Union Shareholder Incentive and Lost Revenue Scenario – To establish the Union shareholder incentive and lost revenue, Union adjusted the CI custom program offering and Large Volume Free Ridership amounts to 54% and set the Spillover rate at 0% (see Table 1 above). These values are consistent with Union's Final DSM Annual Report and its 2015 Audit Adjusted DSM Deferral Accounts and Balances (please see Exhibit A, Tab 1, p. 2, Table 1).

e) The EC did not provide an opinion on the value of Union's DSMVA.

f) The NTG ratios Union used to calculate its shareholder incentive and lost revenue do not include Spillover. Please see the responses to part b) and part c) above for detail.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 4

Question:

a) Per the OEB's August 21, 2015 letter, prior to the EC finalizing the evaluation, measurement & verification plan, Enbridge and Union Gas were "responsible for developing an initial evaluation plan that will inform the evaluation of programs…" Please provide all initial evaluation plans Union Gas developed and provided to the EC related to their 2015 DSM programs.
b) Prior to the 2015-2020 evaluation period, did Union produce an overall DSM portfolio evaluation plan in order to identify key evaluation priorities and guide the annual evaluation process? If so, who reviewed/approved these plans?
    i. If applicable, please provide an example of an overall DSM portfolio evaluation plan developed by Union prior to the 2015-2020 period.
    ii. Please describe how this evaluation plan was used to establish annual evaluation priorities prior to the 2015-2020 period.

Response:

a) The evaluation plans for 2016-2020 were included in Union's 2015-2020 DSM Plan application filed with the OEB on April 1, 2015.[1] Union's 2015-2020 DSM Plan application was approved by the OEB on January 21, 2016 and February 24, 2016. Given 2015 was a transition or roll-over year, Union did not prepare specific evaluation plans for 2015.

b) The 2012-2014 evaluation plans were included in Union's 2012-2014 DSM Plan application filed with the OEB on September 23, 2011.[2] Union's 2012-2014 DSM Plan application was approved by the OEB on February 21, 2012.
    i. Please see EB-2011-0327, Exhibit A, Tab 1, Appendix J.
    ii. During the 2012-2014 DSM Framework annual evaluation priorities were established by the Technical Evaluation Committee per the Stakeholder Terms of Reference.[3]

[1] EB-2015-0029, Exhibit A, Tab 3, Appendix C
[2] EB-2011-0327, Exhibit A, Tab 1, Appendix J
[3] EB-2011-0327, Settlement Agreement, Appendix B, Attachment A, Joint Terms of Reference on Stakeholder Engagement for DSM Activities by Enbridge Gas Distribution Inc. and Union Gas Limited, November 4, 2011

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 6

Preamble: Union Gas states: The OEB explained that going forward the utilities should continue to manage the contractual obligations and costs associated with the NTG Study while OEB Staff assumed responsibility for its oversight. Transition plans were also provided for TRM Development, a Boiler Baseline Study, and a Persistence Study. These transitions have occurred and the TEC has been discontinued.

Question:

a) Per the OEB's March 4, 2016 letter, Enbridge and Union Gas, with the endorsement of the TEC, procured DNV GL to complete a net-to-gross study for custom commercial and industrial projects. When the OEB released its March 4, 2016 letter; more than two years following when Enbridge and Union Gas initiated the procurement process, the study's work plan had not as of yet been completed.
   i. Please provide the timeline for this project. Specifically, please identify:
      - The date the RFP was posted;
      - The date DNV GL (formerly KEMA) was selected as the successful proponent of the procurement;
      - The date DNV GL was contracted to complete the project;
      - The date of the first meeting between DNV GL and the TEC;
      - The date the first draft of the work plan was completed;
      - The date the final work plan was completed;
      - The date DNV GL began implementing the final work plan; and,
      - A description of the final project deliverable provided to Enbridge, Union Gas and the TEC by DNV GL as well as the date it was provided (i.e., the last deliverable before the project was transitioned to the OEB).
   ii. Please provide any documentation related to methodological discussions that were undertaken before the study was transitioned to the OEB.
   iii. Please provide the draft work plan that was to be presented to the TEC on March 10, 2016.
   iv. Please describe the original timing for when the TEC expected the net-to-gross study to be completed.
   v. Please indicate the first year the TEC expected that updated net-to-gross ratios would be applied to Union Gas' DSM results.

vi. Please describe the reasons for the significant delays and specifically why it took an extended period of time to complete the first stage of the project.

b) Per the OEB's March 4, 2016 letter, as part of OEB Decisions issued in 2015, Enbridge and Union Gas were "directed to complete a Boiler Baseline Study in 2015, with the findings incorporated in the evaluation of 2014 results."
   i. Please provide a status update on the Boiler Baseline study.
   ii. With regard to the boiler baseline study, the OEB's March 4, 2016 letter states "This study was the result of OEB decisions for both Enbridge and Union Gas and therefore the utilities are expected to complete it." Please confirm that Union Gas and Enbridge have always retained responsibility for completing the boiler baseline study.
   iii. Please provide an expected timeline for completion of the study.
   iv. Please describe the magnitude of impact the study may have on Union Gas's DSM results for years 2014, 2015, 2016, 2017 and 2018.
   v. Given the OEB's direction that the results of the Boiler Baseline Study are to be retroactively applied to 2014 results, please describe why Union Gas believes the retroactive application of 2015 NTG study results to 2015 results may be inappropriate.

Response:

a) Per the OEB's March 4, 2016 letter, EGD and Union, with the endorsement of the TEC, procured DNV GL to complete a Net-to-Gross ("NTG") Study for custom commercial and industrial programs. The NTG Study's draft work plan was released on March 2, 2016, two days before the OEB released its March 4, 2016 letter and more than two years following when the TEC had initiated the procurement process.
   i. The timeline for this project is as follows:
      - The RFP was posted November 1, 2013;
      - DNV GL (formerly KEMA) was selected as the successful proponent of the procurement on February 17, 2014;
      - The NTG Study contract was executed with DNV GL on May 5, 2015;
      - The first meeting between DNV GL and the TEC occurred on March 10, 2014;
      - DNV provided their NTG Scope of Work on March 2, 2016;
      - A revised work plan, completed under the direction of the OEB as per the March 4, 2016 letter noted above, was expanded to include the annual CPSV portion of the annual audit, and was completed on December 14, 2016;
      - Union does not have a record of when DNV GL began implementing the final work plan because the study and other evaluation activities (formerly TEC activities) had been transitioned to the OEB and no minutes were kept. However, while Union cannot say for certain when the final work plan was implemented, a request for Union's data was sent on November 8 2016; and,

- The final deliverable DNV GL provided to Union, EGD and the TEC was the March 2, 2016 NTG Scope of Work.

ii. Discussions regarding the NTG Study methodology and approach undertaken before the study was transitioned to the OEB are documented in a number of TEC quarterly reports that are stored on the OEB website and summarized below.

- Ontario Natural Gas Technical Evaluation Committee 2014 1st Quarter Report, Section 2.[1]
- Ontario Natural Gas Technical Evaluation Committee 2014 2nd Quarter Report, Section 1.[2]
- Ontario Natural Gas Technical Evaluation Committee 2014 4th Quarter Report, Section 2.[3]
- Ontario Natural Gas Technical Evaluation Committee 2015 1st Quarter Report, Section 3.[4]
- Ontario Natural Gas Technical Evaluation Committee 2015 3rd Quarter Report, Section 3.[5]

Additionally, DNV GL provided memos and documents to the TEC that illustrated the depth and breadth of methodological discussions that needed to be resolved before DNV GL could initiate the work they were commissioned to undertake. A summary of these documents is provided below.

Kick-Off Meeting Memo – Attachment A

Kick -Off Meeting Parking Lot – Attachment B

Attribution Methods Comparison – Attachment C

[1] https://www.oeb.ca/documents/TEC/Quarterly%20TEC%20Reports/TEC%202014%20Q1%20Report.pdf
[2] https://www.oeb.ca/documents/TEC/Quarterly%20TEC%20Reports/TEC%202014%20Q2%20Report.pdf
[3] https://www.oeb.ca/documents/TEC/Quarterly%20TEC%20Reports/TEC%202014%20Q4%20Report.pdf
[4] https://www.oeb.ca/documents/TEC/Quarterly%20TEC%20Reports/TEC%202015%20Q1%20Report.pdf
[5] https://www.oeb.ca/documents/TEC/Quarterly%20TEC%20Reports/Q3%202015%20TEC%20Report_March%20TEC.pdf

iii. The NTG Scope of Work dated March 2, 2016 and presented to the TEC on March 10, 2016, along with the accompanying PowerPoint presentation, are attached as Attachment D and Attachment E, respectively.

iv. The NTG Scope of Work (see Attachment D) indicated the NTG Study would be completed by November 16, 2016. The RFP does not contain an expected timeframe for completion. The Ontario Natural Gas Technical Evaluation Committee 2014 1st Quarter Report states:[6]

> *"The Committee and DNV GL acknowledged that the primary objective of this project is to develop a transparent, reputable study that produces strong, credible, and defensible NTG ratios to be used on a go forward-basis. The potential for 'scope creep' is a concern of several members of the TEC and DNV GL. Having identified some challenges in conducting customer surveys in the summer months (June-August), an updated project completion date will be proposed by DNV GL."*

Union is not aware of any other record indicating an original expected completion date.

v. The TEC quarterly reports, the NTG RFP, and the NTG Scope of Work noted that the NTG Study would be used on a go-forward basis but did not indicate when the results of the NTG Study would be applied. The NTG RFP did not indicate when the results would be applied, however, it did request that the consultant *"Provide guidance on the development of a strategy for applying free ridership and spillover data collected on previous program participation to forward looking DSM program activity."*[7]

As noted in part a) iv) above, the Ontario Natural Gas Technical Evaluation Committee 2014 1st Quarter Report states that the Committee and DNV GL acknowledged that the primary objective of this project is to develop a transparent, reputable study that produces strong, credible, and defensible NTG ratios to be used on a go forward-basis.

vi. The timeline of the significant delays is detailed below.

[6] The Ontario Natural Gas Technical Evaluation Committee 2014 1st Quarter Report, p.2
https://www.oeb.ca/documents/TEC/Quarterly%20TEC%20Reports/TEC%202014%20Q1%20Report.pdf
[7] Exhibit B.Staff.5.Attachment F, p. 10

March 2014

The NTG Study project encountered delays as a result of six issues that arose during the initial kick-off meeting. As documented in DNV GL's Kick-off Meeting Parking Lot Memo (Attachment B), the six issues were:

1. How much contact should the evaluation have with program staff regarding specific projects?

2. Can the evaluation determine which portions of the attribution were due to financial incentives, which were other services, etc?

3. Do we want to make a concerted effort to talk to self-direct customers who only spent a portion of their incentive money? As opposed to customers who used it all because they lose it otherwise.

4. The utilities report lifetime savings; should the evaluation use a dual baseline NTG calculation? If so, how will the evaluation determine existing efficiency baseline savings without doing the full verified gross savings calculation process?

5. There is dissention about when influence occurred and what it means for NTG, largely around projects that receive incentives and are Free Riders in the current program year but were not free riders when they participated the first time in a past program year. How many historical program years should be taken into account by the study in determining NTG?

6. Should the evaluation do spillover analysis with the large industrial customers in Union Gas' new self-direct program, even though there hasn't been much time for them to complete projects? It would give the TEC something to use going forward, even if it's understated.

April and May 2014

The TEC developed draft positions for each parking lot item, noting where discussion was required with DNV GL in order to reach consensus and resolution.

June 2014

The TEC had resolved all but two parking lot items; numbers 4 and 5 above.

July 2014

The TEC discussed the two outstanding items with DNV GL and then reached consensus on item #4 (the study would use the Year One Net Savings Method to determine lifetime savings – instead of the Life Cycle Net Savings Method).

At this time, the TEC came to a consensus agreement that the current guidelines (EB-2008-0346) lacked clarity and with a new DSM Framework for Natural Gas Utilities expected to be established immanently by the OEB, the TEC felt it prudent to gain clarity before continuing with the NTG Study. Therefore, the TEC put the NTG Study on hold until such time that the new DSM Framework was established.

December 2014

The release of the new DSM Framework and Guidelines on December 22, 2014 (EB-2014-0134) did not provide additional clarity to resolve the outstanding project methodology item (#5 above) that had led the TEC to put the study on hold. In Section 7.2.1 of the Guidelines (EB-2014-0134), Free Ridership and Spillover effects are defined; however, no specific policy direction was included as to whether the custom projects NTG ratio should include cumulative year project effects due to the custom program's focus on long term customer relationships concentrating on continuous energy efficiency improvement.

Q1 2015

As noted in the Ontario Natural Gas Technical Evaluation Committee 2015 1st Quarter Report, the committee resolved (with OEB Staff in attendance) to discuss the outstanding methodological item with the consultant in an attempt to find a resolution and move the project forward.

June 2015

On June 9, 2015, the NTG sub-committee reached a resolution for the remaining parking lot issue which was brought forward to the full TEC in July 2015. The resolution achieved consensus agreement and the NTG Subcommittee could then move the project forward.

August 2015

The TEC Subcommittee was unable to meet in August 2015 due to 2015-2020 DSM Plan proceedings. On August 21, 2015, the OEB released a letter establishing the OEB's process to evaluate the results of Natural Gas Demand Side Management (DSM) programs from 2015 to 2020.

Q3 2015

The NTG subcommittee resolved the one remaining issue and reached consensus with the TEC to move ahead with the study.

November 2015
The inaugural meeting for the newly established EAC under the OEB Staff coordinated EM&V process was held on November 23rd.

February 2016
On February 9, 2016, the OEB issued an RFP for an Evaluation Contractor for Natural Gas Demand Side Management (DSM) Programs which closed on March 7, 2016.

March 2016
On March 2, 2016, DNV GL provided the TEC with their NTG Scope of Work, which they presented to the TEC during the final TEC meeting (OEB Staff was present) the week of March 10, 2016. This was the final deliverable provided to the TEC.

December 2016
Nine months later, under OEB Staff coordination, the final work plan was delivered to the EAC on December 14, 2016, the scope of which had been expanded to also contain the annual verification of the utilities custom projects which has traditionally been a part of the annual audit process to ensure annual savings claims are audited and filed with the OEB each year.

October/December 2017
The final report was delivered in October 16, 2017 after which a corrected version was released on December 20, 2017.

b) Union acknowledges that within the OEB's March 4, 2016 letter EGD and Union were directed to complete a Boiler Baseline Study in 2015, with the findings incorporated in the evaluation of 2014 results. It is worth noting that this OEB direction was released after the recommendation to apply the study retroactively was made in relation to 2014 DSM deferrals. The 2014 audit recommendation was consistent with the 2012-2014 DSM Framework which required prescriptive measures to be adjusted retroactively. However, within the current 2015-2020 DSM Framework, adjustments to prescriptive measures apply prospectively and are also used to adjust targets in the following year.

This issue was also discussed in Union's 2014 DSM Deferrals proceeding, particularly in OEB Staff's submission, which does not support retroactive application of the Boiler Baseline Study.[8]

[8] EB-2015-0276, OEB Staff Submission, May 13, 2016, pp. 2-3

i. In October 2017, the consultant issued a memo which described challenges they were having successfully completing the Boiler Baseline Study, having only gathered data from 5 customers of the targeted 140 despite having telephoned over 6,600. In addition to outlining the challenges, the memo also presented options to explore in order to support completion of the study, which included a request for additional funds.[9]

Union and EGD met with the TEC subcommittee in December 2017 to discuss the options the consultant, ICF, proposed for the Boiler Baseline study. The subcommittee agreed to augment the incentive offered to participants and supporting channel partners and requested that ICF test the increased incentive with a small sample of approximately 500 customers to determine whether or not it would yield better results. Aside from paying for the increased incentive, the TEC subcommittee, Union and EGD determined that it was not appropriate to provide additional funds for the project because costs were fixed pursuant to the original procurement process.

Union summarized the subcommittee's agreement with ICF via email in December 2017, and met with ICF in January 2018 to discuss the terms of the subcommittee's resolution. ICF agreed to the proposed resolution and are in the process of testing the higher incentive value for boiler contractors and customers. In March 2018, ICF provided a memo outlining their approach in support of the subcommittee's agreement (please see Attachment H).

ii. Not confirmed.

In light of the evaluation governance in place with the TEC predating 2015, Union and EGD worked with the TEC on a consensus basis to scope and oversee the Boiler Baseline Study. Union and EGD retained responsibility for completing the Boiler Baseline Study after the issuance of the OEB's March 4, 2016 letter, however, they continue to seek input and support and share responsibility for its completion with the TEC Subcommittee.

iii. As noted in the Boiler Baseline Memo (Attachment H), the anticipated completion of the study is July 2018.

iv. Union does not believe it is reasonable to apply an adjustment to a prescriptive measure retroactively given the Boiler Baseline Study is not yet complete and the current framework does not support retroactive adjustments for prescriptive measures.

[9] Exhibit B.Staff.5.Attachment G, p. 4

Furthermore the 2014 deferral has already been closed for over 3 years. For clarity, it is important to recognize the change to the measure would only impact one year if applied retroactively because following year's targets would have appropriately been adjusted.

In terms of order of magnitude that the Boiler Baseline Study would have on 2014 results, Union agrees with the assessment that Board Staff provided in their submission on Union's application for clearance of 2014 DSM deferral and variance accounts,[10]

> *"OEB staff supports the approval of Union's DSM Incentive Deferral Account in the amount of $8,988,000. Although Union does not have the results from the boiler baseline study, the results will have little to no impact on Union's shareholder incentive amount as savings from boiler only represents 1.1% of overall savings."*

In the same submission, Board Staff noted, [11]

> *"As part of the OEB's Decision and Order on Union's application for clearance of its 2013 DSM accounts application (EB-2014-0273), the OEB stated that it was supportive of the proposed boiler baseline study being completed in 2015 in cooperation with Enbridge Gas Distribution Inc., with the findings being incorporated in the evaluation of the 2014 results.[2] In its application, Union indicated that the study results are anticipated in 2016 and, in agreement with the Technical Evaluation Committee, the study results will apply to future savings."*

v. As noted above, it would be inappropriate and a misinterpretation of the OEB's direction to apply the Boiler Baseline Study retroactively.

Similarly, and consistent with Union's deferral claim, applying the 2015 NTG Study results to the 2015 program year is inappropriate and a misinterpretation of the OEB direction.

As noted in 2015-2020 DSM Framework: [12]

> *"The gas utilities should roll-forward their 2014 DSM plans, including all programs and parameters (i.e., budget, targets, incentive structure) into 2015."*

The EB-2015-0029 Decision and Order states, [13]

> *"The OEB does not expect the gas utilities to rely on a predetermined free ridership rate for the duration of the 2017 to 2020 term. In 2016, the free rider rates will be updated based on the results of the net-to-gross study and the annual*

[10] EB-2015-0276, OEB Staff Submission, p.2
[11] EB-2015-0276, OEB Staff Submission, p.2
[12] EB-2014-0134, Report of the Board, DSM Framework for Natural Gas Distributors (2015-2020), p.37
[13] EB-2015-0029, Decision and Order, January 20, 2016, p. 21

evaluation process. Annually, the evaluation process will continue to inform the free rider rates for custom programs."

In addition, the TEC established, with consensus, that the Scope of Work for the NTG Study sought for the consultant to, [14]

> "*Provide guidance on the development of a strategy for applying free ridership and spillover data collected on previous program participation to forward looking DSM program activity."*

Union believes there is clear direction from the OEB to support that both the Boiler Baseline Study and the 2015 NTG Study results are to be applied to future program results.

[14] Exhibit A, Tab 2, Appendix B, p. 10

DNV·GL

Memo to:
Meredith Lamb, Union Gas
Bob Wirtshafter, Wirtshafter Associates
Ted Kesik, University of Toronto
Chris Neme, Energy Futures Group
Jay Sheperd, Canadian Energy Lawyers
Julie Girvan, Uniserve
Ravi Sigurdson, Enbridge Gas
Marc Hull-Jacquin, Enbridge Gas
Tina Nicholson, Union Gas

Date: April, 1, 2014

Copy:
Mimi Goldberg, DNV GL
Tammy Kuiken, DNV GL
Chris Dyson, DNV GL
Susan Weber, DNV GL

Prep. by: Ben Jones, DNV GL

Ontario Gas NTG Evaluation Kickoff Meeting Items

This memo memorializes the discussion at the kickoff meeting for the 2014 Ontario Gas Net-to-Gross Evaluation. It is intended to identify the items that were resolved, assigned (action items), or discussed, but ultimately tabled at the meeting (parking lot items).

Meeting Overview

The kickoff meeting was planned as an in person meeting between the TEC and Evaluation leadership. Most of the time was spent on high level evaluation concepts and in understanding different perspectives within the TEC.

Resolved Items

- The primary objective of this project is a transparent, reputable study that produces strong, credible, and defensible NTG ratios to be used on a go forward-basis.
- The potential scope creep is a concern of several members of the TEC and evaluation team.

Action Items

Two critical path action items were assigned to be completed as soon as possible:

- The TEC will provide draft contract for review by DNV GL legal team.
- The TEC will give DNV GL greater direction on whom to contact for what – data delivery, survey and other review, etc.

Other action items assigned were:

- DNV GL will prepare a memo memorializing the kickoff meeting
- The TEC will provide DNV GL a tentative schedule of TEC meetings for the remainder of the year

- DNV GL will update the project schedule to account for
  - The need to time review of deliverables with TEC meetings
  - Summer vacations in July and August that impact data collection efforts

Parking Lot Items

Several Items at the meeting were discussed but ultimately tabled without a resolution. The "DNV GL Take" below has the evaluation team's thoughts about how each issue should be addressed. The evaluation's plan for addressing the first three items (subject to TEC approval) is described below. Items four through six remain open questions that we have weighed in on, but cannot resolve without additional TEC discussion.

1. *How much contact should the evaluation have with program staff regarding specific projects?*
   - Enbridge (Mark) would like the evaluation to meet with program staff to discuss the specifics of all projects, not just the specific large or complicated ones or the ones we deem need additional information.
   - Other TEC members worry that too much contact with the utility reps will lead to a biased evaluation.
   - *DNV GL Take* – For complex projects, understanding the timing and specifics of the program's interactions with the customer provides the evaluation with the ability to tailor questions prior to the core attribution sequence to the specific customer experience. These custom questions will be phrased to remind the customer about the interactions, while being careful not to bias the customer's responses to the core attribution questions.
2. *Can the evaluation determine which portions of the attribution were due to financial incentives, which were other services, etc?*
   - *DNV GL Take* – The proposed attribution approach and the current scope of the evaluation does not allow for proportionally assigning attribution credit to different program influences. Attribution is also not a zero sum game: both technical and financial assistance may be necessary for a project to proceed; the absence of either one could be enough to prevent a customer from going forward. The surveys and interviews will gather qualitative information about the influence of different program activities on projects. The evaluation will report these (anonymized) responses relative to the final attribution scores in order to provide the TEC and programs some feedback in this area.
3. *Do we want to make a concerted effort to talk to self-direct customers who only spent a portion of their incentive money? As opposed to customers who used it all because they lose it otherwise.*
   - *DNV GL Take* – Assuming that data on this topic is available to the evaluation and categorizing customers by proportion of incentive money spent is straightforward, the evaluation could potentially stratify based on this metric, or not stratify based on it but still attempt to report results for each group separately. Stratification by a categorization allows the evaluation to ensure that one group is not over-represented in the final weighted results, given the potential that there are meaningful NTG differences based on this categorization it likely will make sense to stratify by it if possible.
4. *The utilities report lifetime savings; should the evaluation use a dual baseline net-to-gross calculation? If so, how will the evaluation determine existing efficiency baseline savings without doing the full verified gross savings calculation process?*

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- *DNV GL Take* – If the program tracks dual baseline savings, the evaluation could use the information in our net-to-gross calculations. Otherwise, we might be able to use another approach, such as assuming a ratio of the difference in savings from the dual baselines based on another study.

5. *There is dissention about when influence occurred and what it means for NTG, largely around projects that receive incentives and are free riders in the current program year but were not free riders when they participated the first time in a past program year. How many historical program years should be taken into account by the study in determining NTG?*
   - *DNV GL Take* – This is a crucial question for the evaluation. What type of NTG are we measuring? If the study is intended to capture current program effects then a short time horizon should be used in framing questions for customers and vendors. If the study is intended to show the cumulative effect of the programs over time, then a longer time horizon should be used and past program participation and the effect of that participation on recent within-program projects should be taken into account. The surveys can be designed to capture either type of NTG, but we do not recommend attempting to capture both the current program and cumulative program versions of attribution and spillover at once: this would result in longer, more confusing surveys for customers. This is a critical item to resolve prior to developing survey instruments and interview guides. The decision as to which NTG type to pursue is ultimately a policy decision that may come down to the intent of the Ontario Board of Energy's definition of Net-to-Gross.
6. *Should the evaluation do spillover analysis with the large industrial customers in Union Gas' new self-direct program, even though there hasn't been much time for them to complete projects? It would give the TEC something to use going forward, even if it's understated.*
   - *DNV GL Take* – Most of the data collection with this group of customers is likely to be via in depth interviews (rather than CATI surveys), which offers flexibility to inquire qualitatively about spillover potential for the program going forward as well as whether any spillover has already occurred as a result of the 2013 program. Another possible option is to ask these customers about spillover from previous program experiences in 2011 and 2012, and then ask how the current program design would change the likelihood for future spillover. We recommend leaving this as an open question until the evaluation team learns more about the program and the overlap in customers in the 2011/2012 programs and the 2013 program.

DNV·GL

Memo to:
Bob Wirtshafter, Independent Member
Ted Kesik, Independent Member
Chris Neme, Green Energy Coalition
Jay Shepherd, School Energy Coalition
Julie Girvan, Consumers Council of Canada
Ravi Sigurdson, Enbridge Gas
Marc Hull-Jacquin, Enbridge Gas
Tina Nicholson, Union Gas
Meredith Lamb, Union Gas

Date: June 9, 2015

Copy:
Mimi Goldberg, DNV GL
Tammy Kuiken, DNV GL

Prep. by: Ben Jones, DNV GL

Ontario Gas NTG Evaluation Kickoff Meeting Items

This memo memorializes the discussions of unresolved parking lot items from the 2014 Ontario Gas Net-to-Gross Evaluation kickoff meeting. It is intended to identify which of the items were resolved, assigned (action items), or discussed, but ultimately re-tabled at the meeting (parking lot items). The initial Parking Lot items, DNV GL and TEC takes are retained for context (in grey).

Parking Lot Items Discussed

Several Items at the kickoff meeting were discussed but ultimately tabled without a resolution. The "DNV GL Take" below has the evaluation team's initial thoughts about how each issue should be addressed, while the TEC Take provides the TEC's consensus prior to the follow up meeting.

1. *How much contact should the evaluation have with program staff regarding specific projects?*
    - The utilities would like the evaluation to meet with program staff to discuss the specifics of all projects, not just the specific large or complicated ones or the ones we deem need additional information.
    - Other TEC members worry that too much contact with the utility reps will lead to a biased evaluation.
    - *DNV GL Take* – For complex projects, understanding the timing and specifics of the program's interactions with the customer provides the evaluation with the ability to tailor questions prior to the core attribution sequence to the specific customer experience. These custom questions will be phrased to remind the customer about the interactions, while being careful not to bias the customer's responses to the core attribution questions.
        - The TEC is not in a position to provide endorsement on this point at this time. Discussion with DNV is required.
    - TEC Take:
        - DNV should determine the extent of contact it requires with utility program staff, in order to be fully informed on the customer's relationship with each utility prior to

conducting the Net to Gross survey, given the complexity of the project and the contents of the project files. DNV will follow up as required with the utilities.

- Discussion with DNV is required on the highlighted issue above regarding tailoring questions to remind customers about their interactions with the utility.

- June 11 Follow up discussion results (not discussed on July 16):
  - **TEC Action Item:** TEC to discuss guidelines for framing[1] questions and usage of information from program in probes. Decision required prior to survey instrument development.
  - Open questions on usage of
    - framing questions to remind customer of decision making process
    - program-supplied information in framing question-related probes
  - Rationale for questions and scoring to be provided with survey instruments once drafted.
  - Notes for consideration:
    - Specific questions and probe instructions will be reviewed by TEC prior to fielding interviews. Initial decision for TEC is whether or not the general approach is acceptable.
    - Important to remember that this section of the interview is not part of the scoring algorithm. It is intended to help respondents recall a project and process that may have occurred a few years ago. It is not intended to push the participant into giving more credit to the program than they would if we asked the NTG questions when the decision was fresh in mind. Aiding participant recall through framing questions attempts to remove an aspect of self-report surveys that can potentially bias results against giving programs credit for the decision to install EE equipment.

2. *Can the evaluation determine which portions of the attribution were due to financial incentives, which were other services, etc?*
   - *DNV GL Take* – The proposed attribution approach and the current scope of the evaluation does not allow for proportionally assigning attribution credit to different program influences. Attribution is also not a zero sum game: both technical and financial assistance may be necessary for a project to proceed; the absence of either one could be enough to prevent a customer from going forward. The surveys and interviews will gather qualitative information about the influence of different program activities on projects. The evaluation will report these (anonymized) responses relative to the final attribution scores in order to provide the TEC and programs some feedback in this area.
   - TEC Take:
     - The TEC would like DNV GL to gather and report on qualitative information about the influence of different program activities on projects to the extent that can be done within the defined project scope and budget.

[1] Framing questions are those that remind the customer of the decision-making process and are not used in the attribution scoring.

    - The related item of the construct of the raw data and whether or not it will be shared requires discussion with DNV.
- June 11 Follow up discussion results (not discussed on July 16):
    - TEC Take #1 resolved
    - TEC Take #2 tabled
    - Notes on TEC Take #1 decision:
        - DNV GL to include qualitative discussion in text of participant-reported reasons for results describing NTG and spillover analysis results. Qualitative information will be provided with context such as number of respondents who provided a given reason.
        - Some open-ended responses will be scrubbed and provided in report to add context and support to the results.
- Potential TEC or utility interest in later additional analysis using the data collected
    - Notes on TEC Take #2 discussion:
        - Data must be anonymized before delivery to TEC
        - Decision to be based on usefulness and cost

3. *Do we want to make a concerted effort to talk to self-direct customers who only spent a portion of their incentive money? As opposed to customers who used it all because they lose it otherwise.*
    - *DNV GL Take* – Assuming that data on this topic is available to the evaluation and categorizing customers by proportion of incentive money spent is straightforward, the evaluation could potentially stratify based on this metric, or not stratify based on it but still attempt to report results for each group separately. Stratification by a categorization allows the evaluation to ensure that one group is not over-represented in the final weighted results, given the potential that there are meaningful NTG differences based on this categorization it likely will make sense to stratify by it if possible.
    - TEC Take:
        - The TEC agrees that the sample for Union's self-direct customers should be representative of the entire self-direct program, including both self-direct customers who spent all their allocated funds and those who spent only a portion of them. The TEC will defer to DNV's expert judgment regarding whether stratification based on this variable is appropriate to maximize the accuracy of a NTG for the entire program.
        - DNV should also note that a portion of Union's self-direct funds were not used by customers to which they were initially allocated. Those unused funds were then dispersed via an aggregated pool approach where projects were supported based on their lifetime natural gas savings and cost effectiveness. Again, the TEC will defer to DNV's expertise regarding how to best incorporate NTG impacts from the aggregate pool approach into an NTG for the entire program.
    - June 11 Follow up discussion results: Resolved
        - DNV GL to use expert judgment in making decision
        - Final stratification to be representative

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- The aggregated pool approach may change participant behavior in terms of what measures they do when

4. *The utilities report lifetime savings; should the evaluation use a dual baseline net-to-gross calculation? If so, how will the evaluation determine existing efficiency baseline savings without doing the full verified gross savings calculation process?*
   - *DNV GL Take* – If the program tracks dual baseline savings, the evaluation could use the information in our net-to-gross calculations. Otherwise, we might be able to use another approach, such as assuming a ratio of the difference in savings from the dual baselines based on another study.
   - TEC Take:
     1. The 2008 Summit Blue Free Ridership Study accounted for advancement through the concept of partial free ridership. Thus, the utilities do adjust savings for advancement but do not take a dual baseline approach. The TEC would like to discuss with DNV the alternative approaches.
     2. This item requires discussion with DNV to determine the implications of this for the NTG study. Note that the utilities are about to face a new DSM Framework in 2015. We do not yet know how goals will be set in that framework. It is possible that they will be set differently than the current lifetime savings (CCM) approach. Thus, we would like to know if it would be possible to adjust an NTG result computed for a CCM metric to a TRC metric if such a change was necessitated by a change in the DSM framework? Is DNV able to do a lifetime and annual calculation?
   - June 11 Follow up discussion results: Not Resolved
     - **DNV GL Action Item:** DNV GL to provide simplified explanation of the two approaches and the pros and cons of each.
     - **TEC Action Item:** TEC to decide whether to pursue both methods, or select one. Resolution needed prior to starting analysis.
     - Providing both LCNS and Y1NS results is relatively straight forward, however using LCNS for these programs would require a general rather than specific estimation approach for dual baselines, making it less accurate than its original intended design
   - July 16 Follow up discussion results: Resolved
     - Study will use Y1NS method with lifetime savings
5. *There is dissention about when influence occurred and what it means for NTG, largely around projects that receive incentives and are free riders in the current program year but were not free riders when they participated the first time in a past program year. How many historical program years should be taken into account by the study in determining NTG?*
   - *DNV GL Take* – This is a crucial question for the evaluation. What type of NTG are we measuring? If the study is intended to capture current program effects then a short time horizon should be used in framing questions for customers and vendors. If the study is intended to show the cumulative effect of the programs over time, then a longer time horizon should be used and past program participation and the effect of that participation on recent within-program projects should be taken into account. The surveys can be designed to capture either type of NTG, but we do not recommend attempting to capture both the

current program and cumulative program versions of attribution and spillover at once: this would result in longer, more confusing surveys for customers. This is a critical item to resolve prior to developing survey instruments and interview guides. The decision as to which NTG type to pursue is ultimately a policy decision that may come down to the intent of the Ontario Board of Energy's definition of Net-to-Gross.

- TEC Take: The TEC is not in agreement on what type of NTG the study is measuring (cumulative program effects vs. current program effects). In the absence of both TEC consensus and direction from the Ontario Energy Board, would it be possible in the current budget and scope to calculate the NTG both ways capturing both current and cumulative effects? During discussions, the TEC considered the issues of:
    - Long life cycle projects versus projects of a repetitive nature;
    - The continuous improvement focus of the custom program design;
    - Asymmetrical treatment of accounting for utility influence and savings using a short term approach; and
    - Projects in which the lifetime claim accounts for all behaviours and years versus those projects that do not.
- June 11 follow up discussion results: Not Resolved
    - **TEC Action Item:** Decide which approach is preferred or whether surveys and interviews should attempt to capture both types of program effects. Decision required prior to survey instrument development.
    - Specific program activities that influenced the project we're looking at in this program year are taken into account no matter when they had influence. This applies primarily to the long life cycle projects.
    - Both types of program effects are important. Capturing both is interesting and also allows flexibility if OEB later decides in favor of one approach over the other.
    - Potentially could capture both types for specific projects or project types where the difference is likely to be greatest (recurring O&M for instance)
    - Deciding on one or the other prior to reporting is important to avoid higher stakes debates once results are known
- July 17 Follow up discussion results: Partially Resolved
    - TEC approves capturing long sales cycle program effects in estimation of free ridership
    - **TEC Action Item:** Continue discussion of how to capture "in program" spillover: projects rebated in current year that were free riders based on current year program effects, but attributable to prior program participation. Consensus appeared to be that the study should capture these effects as an incremental portion of net savings so that it can be removed if need be. How to label these savings is also unresolved.
- June 9 2015 Subcommittee meeting results: Resolved (pending broader TEC approval)
    - Subcommittee recommends that the primary objective of the free ridership estimation will be to capture the effect of the program(s) on the current project. (We call this the measurement the "Primary Attribution" below.) The effect on the current

project of prior and indirect program experience will be captured in a secondary, less rigorous question sequence. (We call this effect "Secondary Attribution.").

- Operationally, DNV GL proposes to capture two types of attribution that would complement one another. See examples in Figure 1.
  - Primary attribution will consider all program activities that bear directly on the current study project.
  - Secondary attribution will quantify the programs' effect on company prior EE activity or practices that influenced the project.
    - Research questions for secondary attribution might include
      - Does your company have policies or practices regarding projects like project X?
      - How long have these practices existed?
      - How likely would your company be to have these practices by now without the program?
      - How likely would you have been to do project X without these practices?

Figure 1: Example O&M Participant Attribution

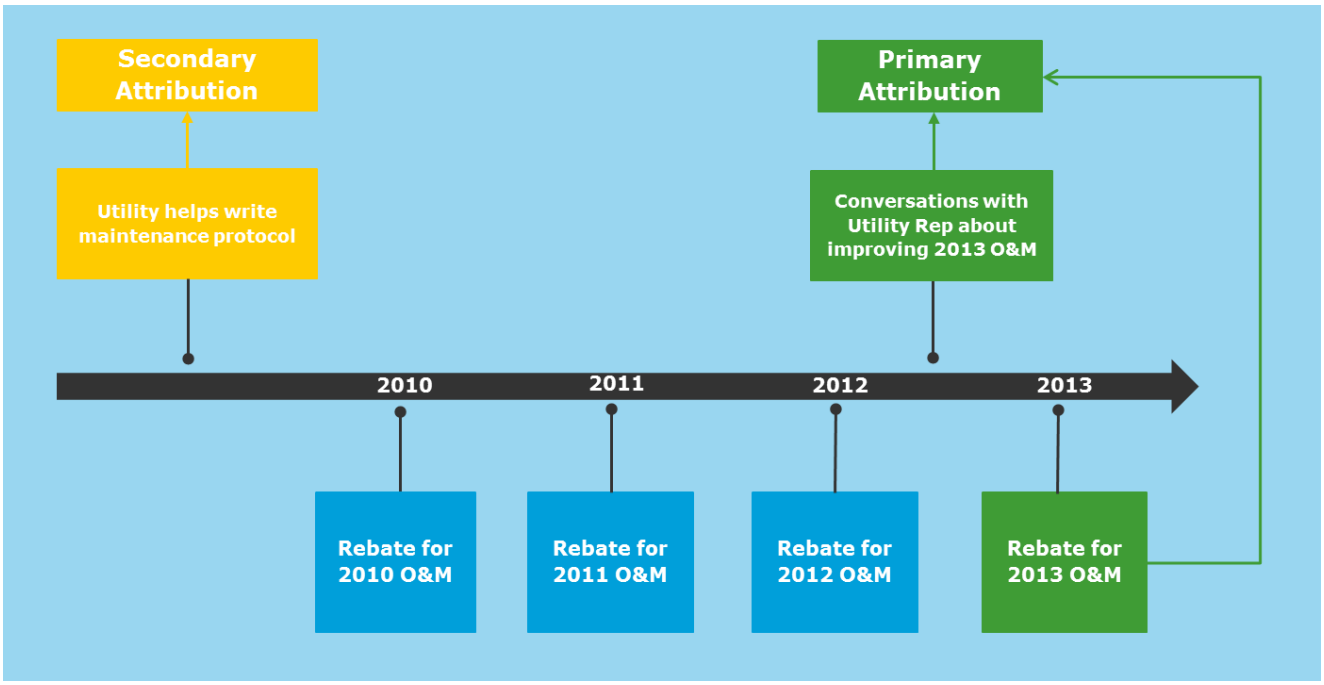
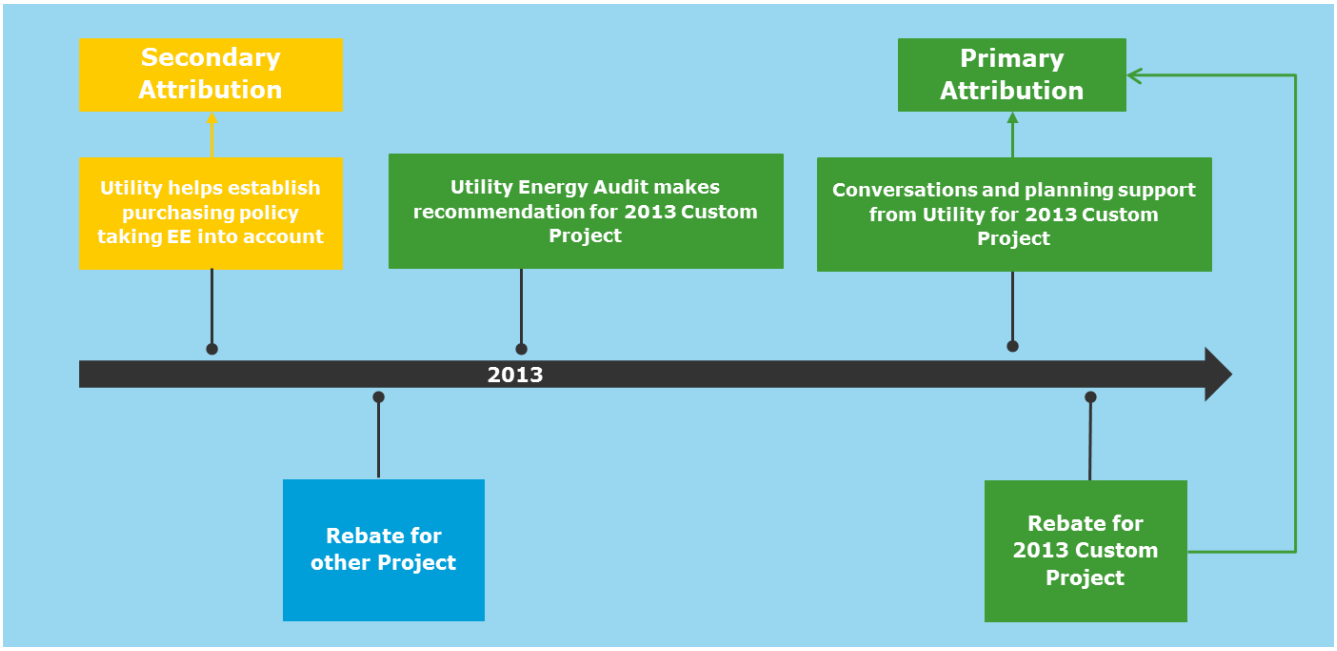


Figure 2: Example Custom Project Participant Attribution



6. *Should the evaluation do spillover analysis with the large industrial customers in Union Gas' new self-direct program, even though there hasn't been much time for them to complete projects? It would give the TEC something to use going forward, even if it's understated.*
    - *DNV GL Take* – Most of the data collection with this group of customers is likely to be via in depth interviews (rather than CATI surveys), which offers flexibility to inquire qualitatively about spillover potential for the program going forward as well as whether any spillover has already occurred as a result of the 2013 program. Another possible option is to ask these customers about spillover from previous program experiences in 2011 and 2012, and then ask how the current program design would change the likelihood for future spillover. We recommend leaving this as an open question until the evaluation team learns more about the program and the overlap in customers in the 2011/2012 programs and the 2013 program.
    - TEC Take: The TEC agrees to leave this as an open item until DNV has had a chance to learn more about Union's self-direct program. After DNV's review of the program, the TEC will expect a recommendation from DNV on how to perform the spillover analysis on Union's self-direct program.
    - June 11 follow up discussion results (not discussed on July 16): Tabled.
        - **DNV GL Action Item**: DNV GL will recommend to the TEC a course of action for estimating spillover for the Union self-direct program once more information has been reviewed.

DNV·GL

Memo to:

Bob Wirtshafter, Independent Member
Ted Kesik, Independent Member
Chris Neme, Green Energy Coalition
Jay Shepherd, School Energy Coalition
Julie Girvan, Consumers Council of Canada
Ravi Sigurdson, Enbridge Gas
Marc Hull-Jacquin, Enbridge Gas
Tina Nicholson, Union Gas
Meredith Lamb, Union Gas

Date: July 2, 2014

Copy:

Mimi Goldberg, DNV GL
Tammy Kuiken, DNV GL

Prep. by: Ben Jones, DNV GL

1 INTRODUCTION

This memo explains the difference between the two DNV GL proposed calculation methodologies for the upcoming Ontario NTG study. The first method, referred to as "Year One Net Savings" (Y1NS) has been employed for over a decade in NTG studies across the United States, including CA and WI. The second method referred to as "Lifecycle Net Savings" (LCNS) is a 2008 update to the Y1NS method. The LCNS has been used in Net to Gross evaluations in both WI (2 years) and MI (5 years). The LCNS more accurately reflects the net to gross over the lifetime of the measure and program by taking into account both how long the measure would be in use as well as the greater savings that result in early years from measures that were accelerated by the program; however more data is required to execute the LCNS than the Y1NS.

The foundation of both the Y1NS and the LCNS methodologies is that energy savings attributable to the program is a function of three changes the program may have made to what was implemented:

- Change to the efficiency of equipment installed, Δ efficiency
- Change to the quantity or size of equipment installed, Δ size
- Change to the timing of when the equipment was installed, Δ timing

It is due to this shared foundation that both methodologies can use the same survey question sequence and start from the same basic scoring approach. The survey asks the program participant about the three aspects of the decision to install the equipment: how the program affected the timing, efficiency and size or quantity of the equipment installed.

Page 2 of 4

First, we consider the "simple program attribution," ignoring the timing factor. From the survey information we determine

FR_e = "efficiency-only free ridership"
= the fraction of the gross savings per unit that would have happened without the program
FR_q = "quantity-only free ridership"
= the fraction of the quantity installed that would have been installed without the program.

The savings that would have occurred without the program is the product of these two.

FR_s = "simple free ridership" = FR_e FR_q.

The simple program attribution is the complement, or

SPA = 1- FR_e FR_q

For example, suppose that a particular customer on their own would have installed

- only 2/3 the number of units that they did through the program, and
- equipment with unit energy consumption half way between that of the high-efficiency program-rebated equipment and that of the baseline efficiency used for the gross savings.

Then FR_q = 2/3 and FR_e = ½. Thus, the fraction of the savings that would have happened without the program would be

FR_s = FR_e FR_q = (1/2) (2/3) = 1/3 or 33%.

SPA = 1-FR_s = 2/3

That is, the program gets full credit for the 1/3 of units they wouldn't have installed at all. For the other 2/3 of units, the program gets half credit, because the program got them to go to a higher efficiency level. Combining these gives a total of 2/3 credit. The only portion of savings the program doesn't get credit for is the portion for which the program affected neither the quantity nor the efficiency.

Both the LCNS and the Y1NS methods use this Simple Program Attribution (SPA) calculation.

Where the two differ is in how they treat the timing information. That difference in turn requires

1) additional data for the LCNS calculation
2) two different efficiency baselines in savings estimates for accelerated measures in the LCNS calculation.
3) LCNS weights results together based on lifetime savings, while the Y1NS method has typically used first year savings only.

2 DATA REQUIREMENTS

In terms of data needed, the LCNS method requires two pieces of data that the Y1NS method does not:

1) estimated useful life for all of the measures installed, and
2) two energy savings estimates for accelerated measures: the energy savings of the measure using a "versus existing equipment" baseline as well as a "versus standard efficiency on the market" baseline

Measure lives are available through secondary sources if they are not already integrated into program tracking databases.

Energy savings estimates using a "versus existing equipment" baseline specific to a sampled measure are usually only available if gross savings verification is conducted with the LCNS in mind. Estimation of dual baselines can be done based on previous studies, but there are not many applicable sources.

3 DURATION OF ENERGY SAVINGS

The Y1NS method uses an annual savings or "first-year" savings value to weight the measure level attribution to the population.

The LCNS method uses the measure lifetime savings to weight the measure level attribution to the population.

What this means for the results is that the LCNS method increases the relative weight for long life measures in the expanded results versus the Y1NS method.

As discussed in the TEC meeting, measures can be weighted by lifetime savings using either method. The lifetime savings calculation is somewhat more complex with the LCNS method.

4 ESTIMATION OF TIMING[1]

The timing component of attribution is sometimes referred to as acceleration, or advancement. For measures that were not "replace on burnout" or "replace on failure," the program may induce the participant to install a measure earlier than they would have otherwise.

The estimation of how much credit the program gets for this acceleration is derived directly from survey responses that the participant gives indicating how much earlier they installed the measure than they would have in the absence of the program.

[1] The question of timing credit for service measures (such as tune ups) is outside the scope of this memo.

In our usual analysis framework, four years is the time horizon beyond which we assume the respondent cannot answer with certainty. Anything beyond four years is treated as a "never would have installed" response, rather than an accelerated measure.

In the Y1NS method the participant responses are divided by four years to give a proportional timing credit to the program. Thus, for the portion determined as attributable from the SPA calculation, acceleration by four years (or more) gives full credit to the program; acceleration by 1 year gives 25% credit to the program. This treatment is equivalent to using the reported timing as an indicator of the probability the measure would have been installed without the program.

The LCNS method interprets the reported acceleration (up to four years) as the literal estimate of how much sooner the measure was installed because of the program. The program is given 100% attribution for the duration of the acceleration period because nothing would have been done without the program during this period. For the remainder of the measure life, the SPA factor says how much of the gross annual savings is attributable to the program.

5 DUAL BASELINES[2]

Gross energy savings for a measure are estimated by subtracting the energy usage of the efficient equipment from the energy usage of a "baseline" piece of equipment (Δ efficiency). There is, and has been much discussion in the industry over which baseline to use when, but resolving this discussion is beyond the scope of this study, which focuses only on net to gross.

For the Y1NS method, a single savings estimate is used for each measure, typically using a "versus standard efficiency on the market" baseline (however that is defined in a given jurisdiction).

For the LCNS method two energy savings values are used, the same "versus standard efficiency on the market" baseline as is used in the Y1Ns and, a "versus existing equipment" baseline which typically has greater savings and is only used during the acceleration period. For example, a participant may replace a 40 year old boiler 2 years prior to the planned replacement due to program incentives. For the first two years, the savings realized by the participant should be estimated based on the efficiency of the old equipment that would have been there otherwise. After two years, the participant would have bought a boiler anyway, so the appropriate baseline is the "standard efficiency on the market."

6 RECOMMENDATION

The LCNS method theoretically provides a more accurate estimate of the net effects of the program, but for this study, without measure specific dual baseline estimates, LCNS is not necessarily any more accurate than the more commonly used Y1NS method. For this reason, DNV GL recommends that the TEC use the Y1NS method for the current study and consider the LCNS method as an option in future studies.

[2] How the "standard efficiency on the market" is determined is beyond the scope of this study. The NTG approach will adapt to the definition used by the programs.

DNV·GL

MEASUREMENT OF NTG FACTORS FOR ONTARIO'S NATURAL GAS CUSTOM COMMERCIAL AND INDUSTRIAL DSM

Scope of Work

for Ontario Natural Gas Technical Evaluation Committee (TEC)

Date: 3/2/2016

Table of Contents

Tables, Figures, Equations

OVERVIEW

This document presents the scope of work for the measurement of net-to-gross (NTG) Factors for Ontario's Natural Gas Custom Commercial and Industrial demand side management (DSM) programs for the Ontario Natural Gas Technical Evaluation Committee (TEC).

The two largest gas utilities in Ontario, Union Gas Limited (Union) and Enbridge Gas Distribution (Enbridge), (together, the "utilities") have offered DSM incentives to businesses for implementing energy efficiency improvements for twenty years. The Union custom incentives are provided as part of the Union commercial program and as part of the direct access program for large industrial customers. The Enbridge custom incentives are provided as part of the Enbridge commercial and industrial programs as well as its Run-it-Right retro-commissioning program.

This evaluation will assess the NTG factors for custom measures in the Union large industrial and commercial programs and the Enbridge commercial, industrial, and Run-it-Right programs. This work plan is a living document that will be updated as new data is incorporated and additional decisions are made.

Evaluation Objectives

The overall goal of this evaluation is to develop transparent free ridership and spillover factors for custom commercial and industrial programs, to be used for future programs.

Evaluation Approach

The methodology selected for this evaluation will rely on end-user self-report surveys and interviews to estimate program NTG. The end user self-reports will be supplemented by project-specific interviews with vendors and vendors to capture indirect effects of the program on end-user decision making. Surveys and interviews will be collected from the most recent program years in order to create NTG factors that will be most meaningful for future years.

For Union's large industrial program and the largest commercial projects and the largest Enbridge industrial and commercial projects, we will estimate NTG using participating end user self-reports and project-specific interviews with vendors.

Key Concepts

This section defines several key concepts that will be used throughout this work plan, using the definitions from the Ontario DSM Guidelines for spillover and free rider.

- *Spillover* "refers to effects of customers that adopt energy efficiency measures because they are influenced by a utility's program-related information and marketing efforts, but do not actually participate in the program."[1] We consider both inside and outside spillover through this project.
    - *Inside spillover* "refers to non-incented measures that were installed within the same project or facility."[2]
    - *Outside spillover* "refers to measures for which the customer did not receive an incentive adopted in an outside location or unrelated project for a participating customer."[3]

[1] Ontario Energy Board *Demand Side Management Guidelines for Natural Gas Utilities,* EB-2008-0346, June 2011, Chapter 7.

[2] Ontario Natural Gas Technical Evaluation Committee (TEC), *Request for Proposal: Measurement of Net-to-Gross (NTG) Factors for Ontario's Natural Gas Custom Commercial and Industrial Demand Side Management (DSM) Programs,* RFP-002-2013 (2), December 2013, Section 2.

- A *free rider* is "a program participant who would have installed a measure on his or her own initiative even without the program." [4]
- *Gross savings* are "the changes in energy consumption and/or demand that result directly from program-related actions taken by participants in an efficiency program, regardless of why they participated."[5]
- *Net savings* are "the changes in energy consumption or demand that are attributable to an energy efficiency program. The primary, but not exclusive, considerations that account for the difference between net and gross savings are free riders (i.e., those who would have implemented the same or similar efficiency projects, to one degree or another, without the program now or in the near future) and participant and non-participant spillover (i.e., savings that result from actions taken as a result of a program's influence but which are not directly subsidized or required by the program). Net savings may also include consideration of market effects (changes in the structure of a market)."[6]
- The *net-to-gross* (NTG) ratio is an adjustment factor that reduces savings due to free ridership and increases savings to account for spillover. The NTG ratio "is the portion (it can be less than or greater than 1.0) of gross savings (those that occur irrespective of whether they are caused by the program or not) that are attributed to the program being evaluated."[7]

[3] Ontario Natural Gas Technical Evaluation Committee (TEC), *Request for Proposal: Measurement of Net-to-Gross (NTG) Factors for Ontario's Natural Gas Custom Commercial and Industrial Demand Side Management (DSM) Programs,* RFP-002-2013 (2), December 2013, Section 2.

[4] Ontario Energy Board *Demand Side Management Guidelines for Natural Gas Utilities,* EB-2008-0346, June 2011, Chapter 7.

[5] SEE Action, Energy Efficiency Program Impact Evaluation Guide: Evaluation, Measurement, and Verification Working Group, DOE/EE-0829, December 2012. https://www4.eere.energy.gov/seeaction/sites/default/files/pdfs/emv_ee_program_impact_guide_1.pdf, page xiv

[6] Ibid

[7] Ibid, page 5-1

SUMMARY OF TASKS

The DNV GL team has broken the project into six discrete tasks which are presented, along with their status, in Table 1. These tasks are discussed in greater detail in the next sections of the report.

Table 1: Key Project Tasks and Completion Status

Key Tasks	
☒	**Task 1: Project Kickoff**
☒	Convene a project kickoff meeting
☒	Reach a consensus on methodology
☐	**Task 2: Sample Design**
☐	Explore the tracking data
☐	Define the unit of analysis
☐	Stratify the data
☐	Design the sample
☐	Prepare the sample frame
☐	**Task 3: Data Collection**
☒	Interview program managers and staff
☐	Interview program Energy Solution Consultants (ESC)
☐	Survey program participants
☐	Interview large or complex program participants
☐	Interview program trade allies
☐	Conduct follow-up interviews with program participants
☐	**Task 4: Data Analysis**
☐	Analyze survey and interview data
☐	Calculate estimates
☐	**Task 5: Reporting**
☐	Produce an evaluation report identifying free ridership and spillover factors for custom commercial and industrial programs
☐	**Task 6: Project Management**
☐	Complete evaluation on time, on budget and within scope
☐	Keep client informed on progress

We have completed the project kickoff meeting, program manager and staff interviews, and initial sample design as part of the planning phase, which have informed the specific plan outlined in this document. Once DNV GL receives the complete tracking dataset we will create the full sample design which will be used to select projects for computer aided telephone interview (CATI) surveys and expert in-depth interviews (IDI). Next, we will request the contact information and necessary documentation to proceed to the participant data collection phase. This will also include interviews with Energy Solution Consultants (ESCs) and vendors who have completed projects through the program. We will calculate the free ridership, spillover, and NTG estimates for each program and domains within programs where there is sufficient sample to provide estimates while protecting respondent confidentiality. These estimates will be provided in the final evaluation report.

Task 1: Project Kickoff

Meeting and Follow-up Memorandum Overview

The kickoff meeting on March 17, 2014 was an in-person meeting between the TEC and Evaluation leadership. Most of the time was spent on high level evaluation concepts and in understanding different

perspectives within the TEC. This meeting was followed by a series of memos with project decisions on April 1, 2014 (kickoff summary), June 12, 2014 (kickoff parking lot items), and July 2, 2014 (methodology explanation). The kickoff was held prior to contract negotiation, which was completed in mid-2015.

Table 2: Task 1 Tasks and Completion Status

Task 1: Project Kickoff Subtasks
☒ **Task 1.1: Convene a project kickoff meeting**
☒ **Task 1.2: Reach a consensus on methodology**

Resolved Items

- **Consensus around primary project objective.** The primary objective of this project is a transparent, reputable study that produces strong, credible, and defensible NTG ratios to be used on a go-forward basis. (4/1/2014)

- **Concern about scope creep.** The potential for scope creep, particularly analysis and reporting of information collected, but not part of the NTG estimation, is a concern of several members of the TEC and evaluation team. (4/1/2014)

- **Consensus for TEC review of data collection instruments.** DNV GL will submit survey instruments, along with probes, question rationale and scoring to the TEC. (6/12/2014)

- **Consensus for qualitative reporting of participant decision making reasons.** DNV GL will include qualitative discussion of participant-reported reasons for results describing NTG and spillover analysis results. (6/12/2014)

- **Stratification determined by DNV GL.** Stratification of survey participants will be representative, as determined by DNV GL's expert judgment. (6/12/2014)

- **First Year Net Savings (Y1NS) method recommended.** DNV GL recommends the use of the Y1NS method for the current NTG study. The LCNS method requires engineering calculations that would add additional scope to the standalone NTG study. (7/2/2014).[8]

[8] July 2, 2014 DNV GL Memo to TEC: *Attribution Method Comparison (Y1NS vs LCNS)*.

Task 2: Sample Design

The objective of the sample design is to select customers for surveys and IDIs to estimate the free ridership and spillover for the custom C&I projects and to create an optimized plan for data collection and expansion. Prior to completing the sample design, we determined that we are likely to attempt a census of participants due to the ratio of targeted completes to accounts in the data provided. Even though we intend to attempt a census, we completed most of the steps required in a sample design to have a basis for post-stratifying the completed surveys and IDIs for expansion to the population.

Through the sample design process, we define:

- The unit of analysis
- The number of surveys targeted for each program
- The number of IDIs targeted for each program
- The stratification that will be used for expansion

This section presents the stratification plan using the initial datasets for 2013 and 2014 custom C&I projects provided by Union and Enbridge. We anticipate receiving updated data, including 2015 projects and the Run-it-Right project data in early March. Table 3 presents the sample design tasks and their completion status.

Table 3: Task 2 Subtasks and Completion Status

Task 2: Sample Design Subtasks	
☐	**Task 2.1: Explore the Tracking Data**
☒	Initial data exploration , Union and Enbridge
☐	Exploration of the full datasets, Union and Enbridge
☐	**Task 2.2: Define the Unit of Analysis**
☒	Initial unit of analysis definition
☐	Final unit of analysis definition using full datasets
☐	**Task 2.3: Stratify the Data**
☒	Initial stratification
☐	Final stratification using full datasets
☐	**Task 2.4: Design the Sample**
☒	Initial sample design
☐	Full sample design and precision optimization
☐	**Task 2.5: Prepare the Sample Frame**
☐	Sample contact information and documentation request
☐	Prepare the sample frame

Task 2.1: Explore the Tracking Data

We first explored the tracking data provided by Union and Enbridge to determine data availability, the number and types of measures installed, as well as the size and quantity of projects. We explored the Union and Enbridge datasets separately.

Enbridge Participant Data

The participant data files provided by Enbridge included custom C&I energy efficiency projects completed during the 2013 and 2014 program years (Table 4). DNV GL has not yet received the 2015 tracking data, nor data for the Run-it-Right program. These data will be included in the final version of this plan. In the 2013 and 2014 Enbridge tracking data, there are 1,603 records and 1,189 unique accounts. The records in

the tracking data are per installed measure, so there may be multiple rows per project if more than one measure is installed, and there may also be more than one project per account. Across the three program years, we expect to have approximately 2,400 records for approximately 1,600 unique accounts.

Table 4: Enbridge Participation Metrics by Year

Program Year	Accounts	Gas Savings (m^3)
2013	681	53,030,333
2014	576	46,195,015
2015 projection*	576	46,195,015

*These data are duplicates of 2014 for reference purposes only.

The tracking data includes measure level savings specific to a measure, site and date. As part of defining the unit of analysis, we used the tracking data variables *load type name*, *end use*, and *technology* to categorize measures into measure types (Table 5). The tracking data we received had some conflicts among identifiers that made it difficult to create consistent measure types across the sample frame. For our initial sample design we divided the measures into two categories: equipment and operations & maintenance (O&M), but we plan to revisit this decision once we receive the complete dataset and we know the overall distribution of measures.

Table 5: Approximate Enbridge Participation Metrics by Measure, 2013-2015*

Measure Type	Accounts	Gas Savings (m^3)
Building Shell	67	3,788,169
Controls	486	25,238,860
Greenhouse	17	5,295,971
Heat Recovery	23	1,696,982
Optimization and Maintenance	182	18,400,956
Other Equipment	107	36,085,459
Process Heat	12	4,179,649
Space Heat	765	39,517,947
Steam and Hot Water	233	4,076,918
Ventilation	211	7,139,452

*These data include duplicates of 2014 to represent the 2015 data.

Union Participant Data

The participant data files provided by Union included energy efficiency projects completed during the 2013 and 2014 program years. At the time of writing this plan, DNV GL does not have data for the 2015 program year. In the 2013 and 2014 Union tracking data, there are 803 records and 392 unique accounts. The records in the tracking data are per installed measure, so there may be multiple rows per project if more than one measure is installed, and there may also be more than one project per account. Across the three program years, we expect to have approximately1,300 records for approximately 600 unique Union accounts.

Table 6: Union Participation Metrics by Year

Program Year	Accounts	Gas Savings (m^3)
2013	197	109,243,796
2014	260	176,508,753
2015 projection*	260	176,508,753

*These data are duplicates of 2014 for reference purposes only.

We used the *project type*, *equipment type*, and *project category* variables in the tracking data to categorize measures. The resulting measure types are presented in Table 7. The largest measure types in terms of savings were maintenance, heat recovery, and building shell. The tracking data we received had some conflicting identifiers that made it difficult to create consistent measure types across the sample frame. For our initial sample design we divided the measures into two categories: equipment and operations & maintenance (O&M), but we plan to revisit this decision once we receive the complete dataset and we know the distribution of completed measures.

Table 7: Union Participation Metrics by Measure, 2013-2015

Measure Type	Accounts	Gas Savings (m^3)
Ag and Greenhouse	65	45,958,821
Building Shell	302	56,606,840
Controls	70	23,204,063
HVAC	59	39,719,864
Heat Recovery	89	71,423,260
Maintenance (O&M)	179	179,305,508
New Construction	17	3,815,481
Optimization (O&M)	62	27,153,170
Other Equipment	38	1,137,342
Steam and Hot Water	45	13,936,954

*These data include duplicates of 2014 to represent the 2015 data.

Task 2.2: Define the Unit of Analysis

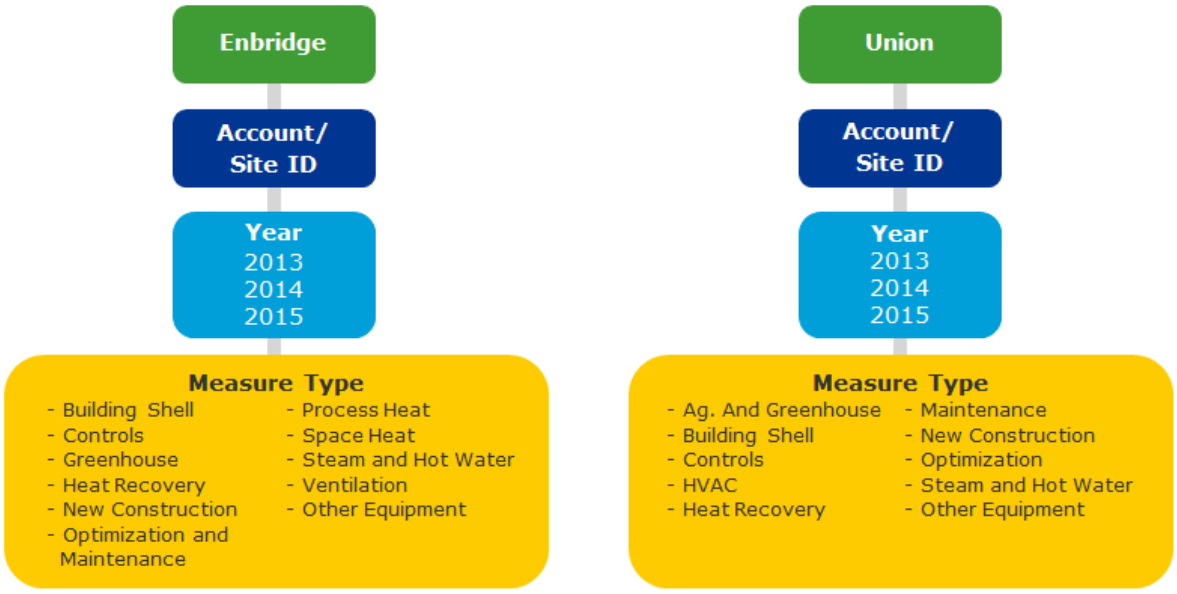
Following data exploration, we defined the *unit of analysis*, which defines the level at which data will be analyzed, but not the level at which it will be collected, which is the *sampling unit*. We further discuss this distinction and how the sampling unit is defined in the Task 2.5 section.

The unit of analysis for this evaluation is a slight aggregation of the records in the tracking database. The purpose of the aggregation is to reduce the number of questions asked in each survey and to reduce the difficulty of parsing decision-making across multiple similar measures. We aggregated across elements that are likely to have less effect on decision making and did not aggregate across distinctions that are likely to play a larger role in how decisions were made.

The unit of analysis used in this sample design, presented in Figure 1, aggregates the data to the utility, account, year, and measure type. For Union, aggregating the tracking data to the unit of analysis reduced

the number of records from 803 to 606 (2013 and 2014 data). For Enbridge, the number of records decreased from 1,603 to 1,471 (2013 and 2014 data).

Figure 1: Unit of Analysis



For this sample design, the unit of analysis and the sampling units are defined differently. While a unit of analysis separates units of different accounts/sites, program years or measure types, the sampling unit is specific to the customer. As an example, one Enbridge customer may have installed a new boiler in 2013 and insulation in 2014 which would be two different units of analysis, but since they were installed by the same customer they belong to one sampling unit. In the analysis phase, weights will be developed for each unit of analysis (account-measure type-year), but for the standard error calculation, data collected from a single customer (sample unit) will be a treated as a cluster rather than evaluated as if they are independent observations

Once aggregated to the unit of analysis, Union had an average of 1.5 units of analysis per account, while Enbridge has an average of 1.2 units per account across the 2013 and 2014 program years. In general, Union accounts tended to have more units of analysis per account than Enbridge accounts. Even so, with a handful of exceptions there were no more than 4 units of analysis per account. This will facilitate data collection, since it's generally reasonable to ask about 3-4 units, especially if 2 of them are the same measure in multiple years.

At this time we are unable to comment on the number of units per customer, though we know accounts some customers will likely have multiple accounts. Customer contact information will be requested in a documentation request following receipt of the final tracking data.

Task 2.3: Stratify the Data

As this is an initial pass at the stratification for a census, we followed a decision making process consistent with sample design, but knowing that we will be reviewing these decisions and making adjustments after data collection is complete. There is a balance between having too many and too few strata. In sample

designs, more strata allow the design to control representativeness and estimated precision along more dimensions. Having more strata can hurt overall precision if variation across strata is less than or equal to variation within each stratum. Our initial stratification design has 108 strata defined by:

- Utility - We are treating each utility's programs as separate populations.
- Commercial vs Industrial vs Run-it-Right – decision making at the broad segment level is likely different due to the different business structures, whereas the design of the Run-it-Right program is very different from the other Enbridge offers.
- O&M vs Equipment – Decision making on equipment is more different from that on O&M than it is on types of equipment
- Program Year – Program year determines the data collected (free ridership vs. spillover or both)
- Size of unit (m^3) - when using ratio estimation with m^3 saved as a weight in the results, stratifying by size ensures that large measures affect the result proportionally and do not have an outsize effect. If this is not a census, stratifying by size would ensure large measures were included in the sample, which is important for the ultimate precision of the study.

Optimization and maintenance measures were grouped separately from the other measures, which involved installing or removing equipment.

Enbridge Stratification

The Enbridge stratification process is presented in Figure 2 and the tracking data summary by the groupings is presented in Table 8. Run-it-Right will follow the same process as the commercial and industrial segments.

Figure 2: Enbridge Stratification

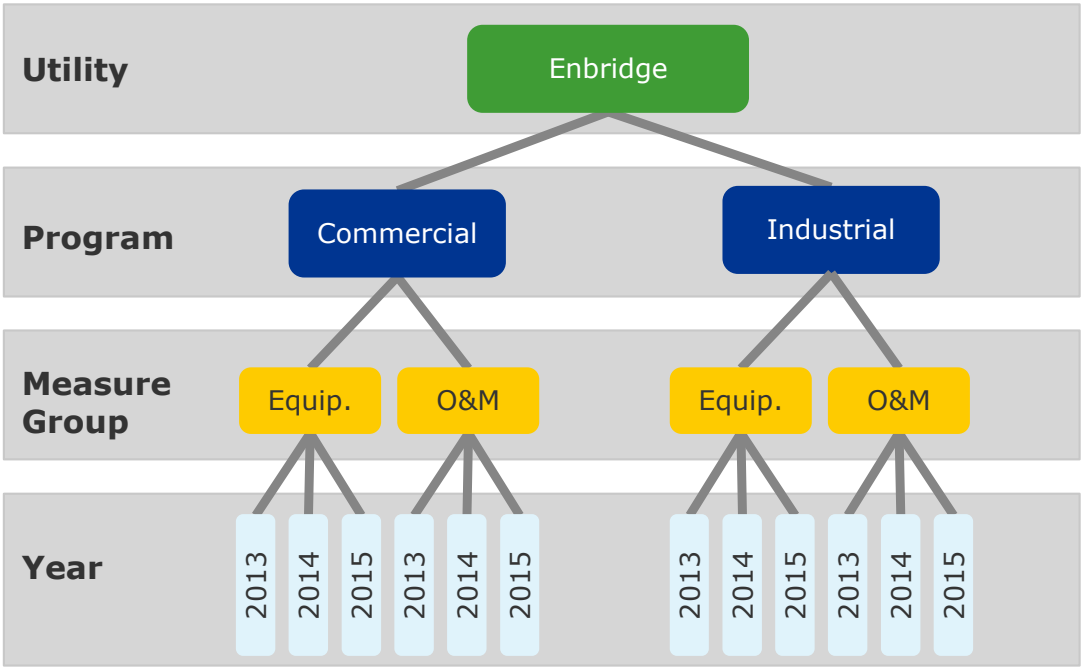


Table 8: Enbridge Participation Metrics by Grouping*

Utility	Program	Measure Group	Year	Accounts	Gas Savings (m^3)
Enbridge	Commercial	Equipment	2013	539	26,126,210
			2014	460	21,371,289
			2015	460	21,371,289
		O&M	2013	53	2,584,681
			2014	33	2,175,656
			2015	33	2,175,656
	Industrial	Equipment	2013	77	22,405,997
			2014	74	17,872,311
			2015	74	17,872,311
		O&M	2013	24	1,913,445
			2014	27	4,775,759
			2015	27	4,775,759

*These data are duplicates of 2014 for reference purposes only.

Union Stratification

The Union stratification process is presented in Figure 3 and the tracking data summary by the groupings is presented in Table 9.

Figure 3: Union Stratification

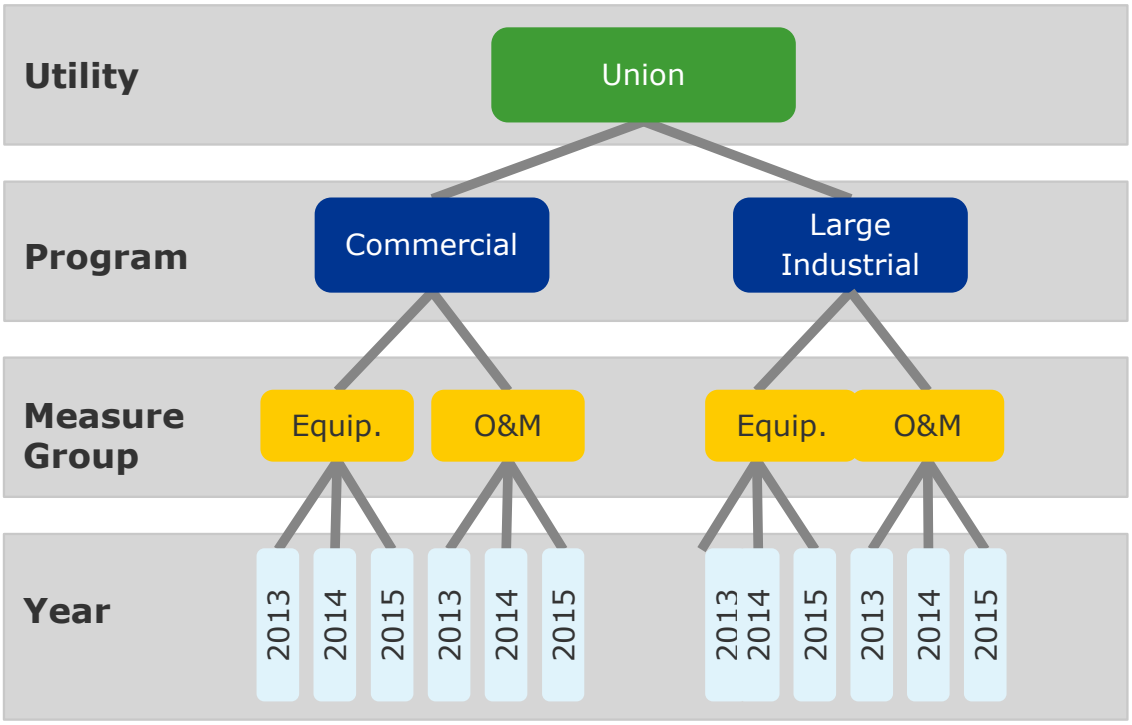


Table 9: Union Participation Metrics by Grouping

Utility	Program	Measure Group	Year	Accounts	Gas Savings (m^3)
Union	Commercial	Equipment	2013	147	28,658,112
			2014	184	45,508,018
			2015	184	45,508,018
		O&M	2013	38	12,823,518
			2014	58	17,855,569
			2015	58	17,855,569
	Large Industrial	Equipment	2013	21	50,632,883
			2014	28	42,747,797
			2015	28	42,747,797
		O&M	2013	16	17,129,283
			2014	36	70,397,369
			2015	36	70,397,369

*These data are duplicates of 2014 for reference purposes only.

Task 2.4: Design the Sample

Prior to completing the initial sample design, we assigned the data collection type for each customer.[9] We did this in order to determine the maximum expected number of respondents since IDI and CATI services have different response rates. We make these decisions at the customer level, rather than the unit of analysis (which includes measure group and year) to estimate the maximum expected number of respondents given the different expected response rates for IDI and CATI surveys. While the data collection will be completed at the sampling unit (customer), we assume that the account number provides a reasonable approximation.

We separated the preliminary IDI sample frame from the CATI sample frame based on three decision rules:

1. All Direct Access program measures
2. Customers with more than two measures
3. The largest customers up to a maximum IDI sample frame of 122 Union accounts and 90 Enbridge accounts. (106 IDIs with a 50 percent response rate).

In the final design, once we have project documentation complexity of measure will also be a consideration.

While we assumed a 50 percent response rate, our interviewers will be taking steps to ensure the highest response rate possible as detailed in Task 3: Data Collection. By assigning the data collection method at this point, we will be able to determine whether there are enough accounts assigned to CATI to use a sample design or if we should use a census. Figure 4 and Figure 5 present the number of units of analysis per account, which are the number of units about which a respondent would be asked, by data collection type using the 2013 and 2014 tracking data only.

[9] Currently this is at the account level, but will be at the customer level once we are able to identify customers with multiple accounts.

Figure 4: Enbridge Units of Analysis, 2013 and 2014

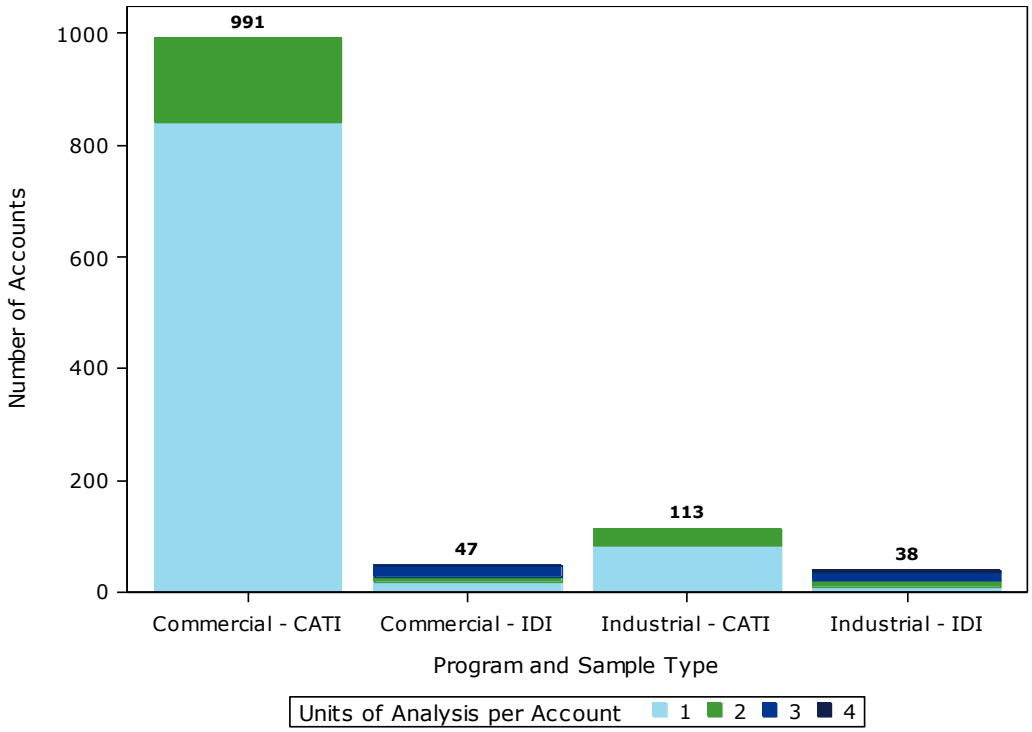


Figure 5: Union Units of Analysis, 2013 and 2014

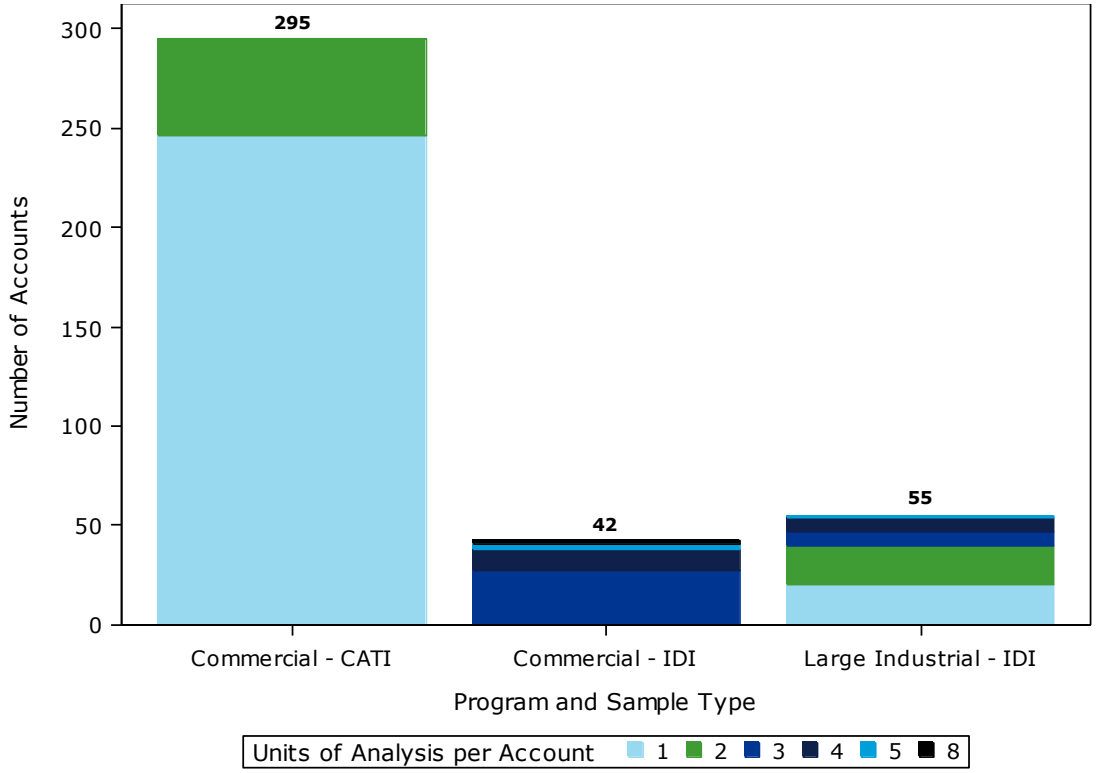


Table 10 summarizes the estimated sample sizes and the corresponding precision, for each overall program. Sample sizes are estimated based on our expected response rate attempting a census for all programs and years. Consistent with our recent experience in data collection for custom C&I programs, the sample sizes assume a 50 percent response rate for the IDI sample and a 33 percent response rate for the CATI sample. Since 2015 data is not currently available, we are using a copy of the 2014 program year as a placeholder for the 2015 data.

Table 10: Estimated Number of Completes and Sample Frame (Analysis Units)

Utility	Program	2013		2014		2015 Projected		All Three Years	
		n	N	n	N	n	N	n	N
Union	Comm and Small Ind	71	208	98	284	98	284	267	776
	Large Industrial	17	41	31	73	31	73	79	187
	Overall	**88**	**249**	**129**	**357**	**129**	**357**	**346**	**963**
Enbridge	Commercial	216	683	175	558	175	558	566	1,799
	Industrial	40	116	41	114	41	114	122	344
	Run-It-Right								
	Overall	**256**	**799**	**216**	**672**	**216**	**672**	**688**	**2,143**

Note; n= sample size (estimated number of completes), N= estimated number in sample frame

The study seeks to achieve 90/10 overall precision representing future participation. To project to future participants, treated as effectively an infinite population, we developed the precision estimate for the study without applying the Finite Population Correction. The table shows our estimates for the go forward non-FPC precision for each program. These estimates are based on the 33% CATI and 50% IDI response rate assumptions, a 0.7 error ratio (estimate of variance) the 2013/2014 program year data, and the stratification described above. Free ridership is based on 2014 and 2015 participants, while spillover is based on 2013 and 2014 participants. The final achieved precisions will depend primarily upon our response rates for the large customers.

Table 11: Anticipated Sample Sizes and Precision as Estimate for Future Program

Utility	Program	Free ridership		Spillover	
		n	RP	n	RP
Union	Comm and Small Ind	196	5%	169	5%
	Large Industrial	62	11%	48	17%
	Overall	**258**	**6%**	**217**	**10%**
Enbridge	Commercial	350	5%	391	5%
	Industrial	82	10%	81	10%
	Run-It-Right				
	Overall	**432**	**5%**	**472**	**5%**

Note; RP = relative precision at the 90% confidence level

Task 2.5: Prepare the Sample Frame

Once we have completed the final sample design, we will submit a data request to the utilities. The specific types of information we will be requesting are outlined in Table 12. The decision maker may not necessarily be located at the site where the project occurred and may be the same for multiple projects at multiple sites. The technical expert is someone who will be able to answer questions regarding the specific engineering specifications of the equipment. Vendors are the third party firms that were involved in the sale or design of the equipment, or the sale and performance of the O&M services.

Table 12: Information to Be Requested

Requested Information	Project Year		
	2013	2014	2015
Site Address	√	√	√
Project Documentation	√	√	√
Decision Maker Contact Information: ▪ Full Name ▪ Role ▪ Mailing Address ▪ Email Address ▪ Direct Business Phone Number	√	√	√
Technical Expert Contact Information: ▪ Full Name ▪ Role ▪ Mailing Address ▪ Email Address ▪ Direct Business Phone Number	√	√	
Vendor Contact Information: ▪ Full Name ▪ Role ▪ Mailing Address ▪ Email Address ▪ Direct Business Phone Number	√	√	√

Once we have received the requested contact information, we will identify instances where a contact was involved in multiple projects, even across sites. While the projects are conducted at the site level, the decision maker, technical expert, or vendor may have been involved in projects at multiple sites. For example, multiple participating sites for the same retail chain may have one energy manager from the corporate office but the technical expert may be site specific. Using this contact information and taking into account cross-site involvement, we will assemble the CATI and the IDI sample frame.

Task 3: Data Collection

Table 13: Task 3 Subtasks and Completion Status

Task 3: Data Collection
☒ **Task 3.1: Program Managers and Staff Interviews**
☒ Union Gas Program Portfolio Management
☒ Enbridge Commercial Program Managers
☒ Enbridge Industrial Program Managers
☒ Enbridge Run-It-Right Program Managers
☐ **Task 3.2: Program Energy Solutions Consultants Interviews**
☐ Energy Solution Consultant Interview Guide
☐ 10 pre-survey interviews
☐ 10 follow up interviews
☐ **Task 3.3: Program Participant CATI Survey**
☐ CATI survey Instrument
☐ CATI survey interviews completions attempted
☐ **Task 3.4: Program Participant In-Depth Interviews**
☐ In-Depth Interview Instrument, mirroring CATI instrument
☐ IDI completions attempted
☐ **Task 3.5: Program Participant Engineer Interviews**
☐ **Task 3.6: Participating Vendor In-Depth Interviews**
☐ In-Depth Interview Instrument
☐ 80 IDI completions attempted

Note; the number of CATI and IDI completion attempts will be filled in once we receive the final dataset.

Objectives

To inform this NTG evaluation, the evaluation team will collect information from both Custom C&I program participants and key program actors. The following table shows the participants and key program actors we plan to target and what aspects of influence on the energy efficient project we are planning to explore. We expect that for some larger energy efficiency projects, but not all projects, the Energy Solutions Consultants will be familiar with some project-specific details.

Table 14: Aspects of Influence on the Energy Efficient Project

Aspects of Influence	Program Participants	Participating Vendors	Program Managers	Program Energy Advisers
Program influence on the participant's general practices	√		√	√
Program influence on the vendor's general practices and equipment recommendations		√	√	√
Program influence on the specific project	√	√		√ *
Vendor influence on the specific project	√	√		√ *

*(possibly for larger projects)

Activities

To inform this NTG evaluation, the evaluation team will collect information from both Custom C&I program participants and key program actors. The following table shows the participants and key program actors we plan to target and what aspects of influence on the energy efficient project we are planning to explore. We expect that for some larger energy efficiency projects, but not all projects, the energy advisers or utility account representatives will be familiar with some project-specific details.

The following is a summary of the number of interviews we plan to complete. A more detailed breakdown of our target number of surveys and interviews is provided in the description of the methodology in Task 2: Sample Design. As discussed in that section, many of the estimates of the targeted number of completed surveys are preliminary pending more precise information concerning the size of the participating customer populations, the mix of customer sizes, the mix of project sizes, the size of the participating vendor population, the number of participant spillover projects, etc.

Table 15: Target Number of Completed Surveys/Interviews

Phase 1		Phase 2		Phase 3	
Program Managers/Staff (In-Depth Interviews)	Program Energy Advisers[10]	Program Participants (CATI Surveys)	Program Participants (In-Depth Interviews)	Program Participants (Engineering Follow-Up Interviews for Spillover)	Participating Vendors (In-Depth Interviews)
Up to 6	10 + 10	≤2,200 *	≤430 *	≤80 *	≤80 *

*Note; The number of CATI and IDI completion attempts will be filled in once we receive the final dataset. All numbers represent the maximum number of surveys or interviews.

Shortly after the scope of work is finalized and approved, DNV GL will submit draft interview guides and CATI surveys to the EAC for review. The final interview guides and survey instruments will address any comments or suggestions from these reviewers. While this review process is ongoing, we will also check with the EAC and the relevant utility and program contacts to insure that we are talking to the appropriate people, have the necessary contact information, and have an advance letters from the utilities.

Timing

DNV GL recognizes the limitations of the calendar in conducting survey research. During summer months, holidays increase the difficulty in reaching individuals. DNV GL will take efforts to conduct the majority of data collection before the height of summer holidays. Typical survey protocol dictates that contact with a survey respondent should be attempted 6-8 times before being considered 'exhausted'; DNV GL will adapt survey protocols to ensure that contact with an individual is not attempted more than 2x in a given calendar week and 3x in any two weeks to ensure that holidays do not influence response rates.

Informed Respondent

For data collection efforts involving non-program staff (e.g., participant surveys, participant interviews, participant follow-up interviews, participating vendor interviews), DNV GL will include a question battery designed to ensure that only informed respondents are participating. For participating customer

[10] Program Energy Advisors will be interviewed both in Phase 1 and Phase 2.

respondents, DNV GL will define informed respondents as interviewees who directly participated in the project(s) in question. For participating customer respondents, DNV GL will make every effort to reach informed respondents. We define informed respondents as interviewees who were:

1) Aware of the program at the time of the project; and
2) Either directly involved in the decision to choose equipment and go forward with the project or reasonably familiar with the project's decision-making process.

Some companies with multiple projects and diverse decision makers may require multiple interviews. We will not administer survey for projects where the informed respondents are not available. DNV GL will include a battery in each relevant instrument aimed at confirming the individual interviewed is an appropriate informed respondent.

Response Rates

Survey response rates have been in decline over the past decade. This is especially true for residential surveys, where cell-phone only households have made surveying difficult, but there has also been erosion of response rates for business surveys. In order to achieve increased response rates, DNV GL will prompt program participants with both advance emails and advance letters, informing them of the survey and requesting participation. Advance letters, sent through traditional postal mail, are generally better received (and read) when sent by the recognized energy provider and should be sent on utility letterhead, if possible.

In order to execute the mailings, it is critical that DNV GL be provided with accurate contact information for the correct informed respondent. This will include, but is not limited to, the correct individual's:

- Full Name
- Role
- Mailing Address
- Email Address
- Direct Business Phone Number

DNV GL will send the above-mentioned emails and letters to all program participants included in the CATI sample frame as well as those program participants identified for IDI, and participating vendors. For IDIs, there is an additional opportunity to improve response rates – providing respondents with the opportunity to schedule their own interview time. DNV GL will accomplish this with either an invitation to email DNV GL directly about preferred times or will utilize an online scheduling service where individuals may choose their own preferred times.

Handling of Optimization and Maintenance Projects

Optimization and Maintenance projects will be separated from equipment installation in the sample design and require special consideration for data collection as well. Maintenance projects in particular are by their nature recurring. The question of how to credit the program for maintenance this year when the customer participated in the past is complex. DNV GL and the TEC considered this issue while finalizing the contract and decided that the primary objective of the free ridership estimation will be to capture the effect of the program(s) on the current project. The effect on the current project of prior and indirect program experience will be captured in a secondary, less rigorous question sequence.

The primary attribution questions will be framed by questions that ask about decision making for the current project alone so that the scored attribution sequence will capture the effect of the program on the current project. After the scored section of the survey is complete we will capture the indirect, longer term attribution effect by asking:

- "Now, without *any* utility assistance for *any* projects in the past, on a scale of 1-10 what is the likelihood that you would have <taken this EE Action>?

The maximum of the primary attribution and this score will provide us with an idea of how much higher attribution would be if a longer term view were taken.

To limit customer burden and ensure the validity of our spillover analysis we will limit the investigation of secondary attribution to:

- *Measures with less than 100 percent primary attribution*: if primary attribution is 100 percent, then secondary attribution is as well
- *2015 participants*: 2015 participants will not be asked spillover questions. It would be awkward to ask about spillover and then secondary attribution. It could affect the results to ask about secondary attribution prior to asking about spillover.

Deliverables

- Program participant CATI survey instrument (draft and final)
- Program participant IDI guide (draft and final)
- Participating vendor IDI guide (draft and final)
- Program manager and staff IDI guide (draft and final)
- Program Energy Solutions Consultant IDI guide (draft and final)
- CATI and IDI participation email & mail scripts

Task 3.1: Program Managers/Staff (In-Depth Interviews, Phase 1)

In order to better understand program logic, methods, execution, and intent, DNV GL conducted IDIs with program managers and then program staff. These interviews focused one:

- Details of how the program design
- Details of how the program is implemented and marketed
- Understanding the program theory and logic
- Identifying key staff such as Energy Solutions Consultants and what roles they play,
- Identifying how decisions are made
- Identifying how communication between parties occurs.

DNV GL staff interviewed program staff from Enbridge and Union on the following dates:

Table 16: Program Manager Interviews

Date	Company	Program
1/22/2016	Union Gas	Program Management - Portfolio
1/25/2016	Enbridge	Commercial Programs Interview
1/29/2016	Enbridge	Industrial Programs Interview
1/29/2016	Enbridge	Run-It-Right Program Interview

Task 3.2: Program Energy Solutions Consultants (Phases 1&2)

Ten Energy Solutions Consultants will be interviewed by experienced DNV GL staff prior to the creation of program participant survey instruments, in order to better inform those instruments. Five ESCs will be interviewed from both Enbridge and Union Gas (10 total interviews), with a distribution of consultants speaking to all commercial and industrial programs. An original list of topics has been modified following interviews with program managers. Topics for interview will include:

- Their typical responsibilities
- The nature of their routine communications and interactions with Custom C&I customers and how this might vary with the size of the customer or the customer type (e.g. chain stores)
- How they target program recruitment at Custom C&I customers of certain types or in certain areas
- Nature of program recruitment; communication type by customer size and rate class
- How they become aware of potential energy efficiency projects
- How they promote energy efficiency
- How they identify which customer representatives are the key project decision makers
- Which customer representatives are the key project decision makers and how this might vary depending on company/organization size or type
- At what stage in project development they typically get involved with a project
- How many projects are typically rejected
- What are the barriers to program participation and how they try to mitigate them
- What information, financial incentives or technical assistance they offer to Custom C&I customers for energy efficiency projects
- What they perceive to be their most valuable contributions to the development of energy efficiency projects
- How frequently the rely on program technical support staff for project support
- How closely they monitor the progress of active projects
    - If there is any evidence of project cancellations due to free ridership
- Whether they have received any training or guidance on how to minimize free ridership
- Whether there are any warning signs that a project might be a free rider
- What roles trade allies play in project identification and how they interact with them
    - How trade allies work to mitigate free ridership

Following initial interviews and surveys of program participants, DNV GL staff and engineers will return to call up to ten of Energy Solutions Consultants to collect additional information about specific projects that will be useful for measuring program attribution. In such cases staff will ask project-specific questions such as:

- Whether they were involved in originating the project idea and, if so, what was their role
- Whether they were involved in planning and the development of the project details, and if so, what was their role

- Whether they were involved in the decision to go ahead with the project, and if so, what was their role
- At what stage in this project conception, planning and development process they got involved
- Whether they thought the availability of the Custom C&I program financial incentives had any influence on the timing or character of the project and if so, what was the nature of this influence
- Whether they thought any other Custom C&I program services (e.g., training, audits, technical assistance, helping find a vendor, selling the project to upper management, etc.) that the participant received had any influence on the timing or character of the project and if so, what was the nature of this influence

Task 3.3: Program Participant CATI Survey (Phase 2)

For the CATI surveys and IDIs with participants, we are developing flexible instruments that will have different modules depending on the year in which the Custom C&I customer participated. Table 17 shows how these modules will be distributed across the program years.

Table 17: Net-to-Gross Survey Modules Depending on Program Year

Net-to-Gross Modules	2013 Participants	2014 Participants	2015 Participants
Free Ridership	√*	√	√
Spillover	√	√	

*The free ridership estimates from this program year will only be used to inform the spillover analysis and will not be used for the core free ridership analysis.

There is no spillover module for the 2015 participants because we are assuming that not enough time has elapsed for the large majority of these participants to have done a spillover project. It is possible that some of the largest customers may have done a spillover project in this short timeframe. Since these large customers (3 or more projects) will be covered by IDIs, we will give the interviewers the flexibility to administer the spillover questions if a spillover project is identified. However, our survey cost estimates assume that for most of the 2015 participants we will not administer the battery of spillover-related questions. As the table indicates, we will be collecting free ridership information from the 2013 participants because this information is required for our participant spillover methodology, but we will not be using these data for our core free ridership calculations because we would prefer to use more recent program years.

OUTLINE:

- **Introduction**
- **Informed Respondent**
    - Cite specific project, determine involvement
        - Program awareness
        - Equipment choice
    - Role
    - Responsibilities
    - Ask about how long at company (since before the project date?)
- Identify names of other primary project contacts, for potential follow up conversation with DNV GL engineer

- **Organization Policies and Purchase Procedures**

- **General Program Awareness and Interactions**
- **Specific project verification (Framing)**
  - When first considered?
  - Reasons for project?
  - Major sources of info?
  - The general decision-making concerning energy related purchases and practices
  - Who in their company or organization makes decisions about equipment replacement and retrofit projects and how this might vary with the size or cost of the project
  - What information sources are used in making these decisions
  - Whether the company/organization has any formal requirements or informal guidelines about the purchasing of energy using equipment and, if so, what are these requirements/guidelines
  - Whether their company has a corporate "green " mandate
  - The development of the specific program-incentivized project
  - Where the idea for the project originated and who were the key persons involved in the project conception -- whether within the participant's company/organization or without (e.g., vendors, Custom C&I program Energy Solutions Consultants)
  - Who was involved in the planning and development of the project details
  - Who was involved in the decision to go ahead with the project
  - At what stage in this project conception, planning and development process did the Custom C&I program get involved
  - Whether the program provided any services to the respondent's company/organization beyond the financial incentives (e.g., training, audits, technical assistance, helping find a vendor, selling the project to upper management, etc.). To inform the free ridership questions, the interviewers will have information on all program activities reported by the tracking databases, but this query is designed to collect information on program activities that may be unreported and also to find out which program activities were top-of-mind for the respondent.
  - Whether the project changed from its original conception and what these changes were and why they were made

- **Direct attribution battery**
  - Determining the overall influence of the program, along with program effects on
    - Timing
    - Efficiency
    - Sizing or Quantity

- **Spillover battery**
  - Inquire about additional projects *after* other projects[11]
    - First check to ensure not rebated
    - Project type
    - Project data
    - Project contact

[11] Information collected regarding additional projects will be used not only to calculate spillover, but to check against program records and ensure that the project was not a tracked project with direct attribution.

- Project location
- Project dates

- **Firmographics**
  - Business type and
  - Business size (ft2 and # of employees)
  - whether they lease or own their facilities

- **Closing**

Task 3.4: Program Participant In-Depth Interview (Phase 2)

In addition to executing telephone interview surveys for standard projects, DNV GL staff will conduct IDIs with participants of particularly large or complex projects. The subjects covered in the IDIs are the same as with standard projects, following the same outline. In DNV GL's experience large and complex projects do not lend to pre-programmed interviews in the same way that standard (single) projects do, as it may be necessary to speak with multiple individuals or to dive deeper into questions to determine answers to questions than can be completed in a fully programmed interview. Conducting IDIs of customers with large or complex projects is a standard method for DNV GL, with experienced and expert interviewers conducting all interviews. These interviews are typically conducted with the 'decision maker' – an informed respondent who has at least some say in whether or not to proceed with a project and is aware of the project's impacts.

Task 3.5: Program Participants (Engineering Follow-Up Interviews for Spillover, Phase 3)

For some projects, it will be necessary to follow up with an additional individual or individuals, aside from the 'decision maker'. Engineering follow up calls are a specialized form of IDI that are conducted between a DNV GL engineer and an individual at the customer site that can speak to the specific engineering specifications of the equipment. DNV GL will ask specific questions that will allow for the calculation of energy savings.

These interviews will be individually tailored, depending on equipment installations, with the goal of gaining information to calculate energy savings.

Task 3.6: Participating Vendors (In-Depth Interviews, Phase 3)

Vendors that performed work on projects identified in the sample will also be interviewed. IDIs with up to 80 of these vendors will follow the following outline:

- **Introduction**
- **Informed Respondent**
- **Company background**
  - Which products or services they sell
  - Which types of C&I customers they typically do business with
  - What the size of their company is

- **Sales and marketing**
  - How they promote energy efficiency
  - How they identify which customer representatives are the key project decision makers
  - Which customer representatives are the key project decision makers and how this might vary depending on company/organization size or type
  - What role the Custom C&I program incentives play in their sales pitches

- **General program involvement and influence**
  - How they became involved with the Custom C&I program
  - Why they became involved with the program
  - How frequently they offer program incentives
  - How frequently they interact with program staff
  - How they keep track of Custom C&I program incentives and requirements
  - Whether the Custom C&I programs have provided them with any sales leads
  - Whether they have received any training from the program
  - Whether there are other services that the program provide them
  - To what degree the Custom C&I program incentives and other services influence the implementation of energy efficiency projects in the C&I sector
  - What types of C&I customers are more likely to be influenced by program incentives and which types are less likely to be influenced
  - Whether they are offering energy efficient products or services through the program that they did not offer before becoming involved with the program
  - Whether they are recommending energy efficient products or services more frequently now than they did before becoming involved with the program
  - Whether they have suggestions as to what kind of interventions would increase the program's influence in the project

We will call back some of the vendors to collect additional information about the project that will be useful for measuring program attribution. In such cases we will ask some project-specific questions such as:

- Whether they were involved in originating the project idea and, if so, what was their role (informed respondent)
- Whether they were involved in planning and the development of the project details, and if so, what was their role
- Whether they were involved in the decision to go ahead with the project, and if so, what was their role
- At what stage in this project conception, planning and development process they got involved
- Whether they thought the availability of the Custom C&I program financial incentives had any influence on the timing or character of the project and if so, what was the nature of this influence
- Whether they thought any other Custom C&I program services (e.g., training, audits, technical assistance, helping find a vendor, selling the project to upper management, etc.) that the participant received had any influence on the timing or character of the project and if so, what was the nature of this influence.

Task 4: Data Analysis

Table 18: Task 4 Subtasks and Completion Status

Task 4: Data Analysis Subtasks
☐ **Task 4.1: Analyze Survey and Interview Data**
☐ Sample frame data transformation
☐ Sampling weight
☐ Data validity check
☐ **Task 4.2 Calculate estimates**
☐ Attribution
☐ Spillover
☐ Net-to-gross

Objectives

Once a critical mass of CATI surveys and IDIs have been completed, we will begin the analysis phase (in parallel with the completion of data collection). In this section, we describe the initial survey and interview data analysis as well as the calculation of attribution, spillover, and NTG.

Task 4.1: Analyze survey and interview data

The analysis flow after data collection begins with transforming the collected data back to the level of the unit of analysis. This translation depends on the number and grouping of program measures or projects asked about for an individual customer, and whether subsampling was required.[12]

The survey will collect attribution information on each measure type. We apply the free ridership and spillover "scoring" methods to determine the free rider and spillover factors for each measure type. We then apply these factors to the associated gross savings to produce net-of-free riders and spillover savings for each measure type. Data collected from a single customer will be treated as a single cluster in error estimates.

We will use the sampling weights created during the sample design process to expand the customer sample in each sampling cell (stratum) to represent the full participant population in that cell. Targeted cells for which we are unable to obtain any responses will either be treated as not represented by the sample, or will be collapsed with other cells for sample expansion.

The application of attribution and spillover algorithms that convert survey and interview data into energy savings values ready for expansion involves consistency checks for each respondent. These checks utilize both questions directly used in the algorithms and verbatim responses that contain information on the reasoning of the respondent's responses.

Task 4.2: Calculate Estimates

The last analysis step involves expanding the attribution and spillover savings to the population via ratio estimation, and generating the combined NTG ratio for each segment of interest. . We will estimate inside

[12] Based on the initial data we do not anticipate needing to subsample: few accounts had more than two units. This may change once we have 2015 data and information that allows us to identify unique customers.

and outside spillover (inside spillover occurs at the same site as the program measure) separately for each segment, and sum them to determine total spillover.

We will then calculate corresponding ratios across the segment:

Equation 1: Free Rider Savings

$$FR = \frac{Weighted\ sum\ of\ NFR}{Weighted\ sum\ of\ G}$$

Where:

NFR = Net of free rider savings

G = Gross savings

Equation 2: Net of Free Rider Savings

$$NFR = 1 - FR$$

Equation 3: Inside Spillover

$$SO_{inside} = \frac{Weighted\ sum\ of\ S_{OI}}{Weighted\ sum\ of\ NFR}$$

Equation 4: Outside Spillover

$$SO_{outside} = \frac{(Weighted\ sum\ of\ S_{OO})}{Weighted\ sum\ of\ NFR}$$

Equation 5: Total Spillover

$$SO = SO_{inside} + SO_{outside}$$

Where:

S_{OI} = Inside spillover savings (0 for customers with no spillover)

S_{OO} = Outside spillover savings (0 for customers with no outside spillover)

Equation 6: Net-to-gross Ratio

$$NTG = (1 - FR)(1 + SO)$$

We calculate spillover as a fraction of net of free rider savings, but this can also be reported as a fraction of gross savings.

Task 5: Reporting

Table 19: Task 5 Subtasks and Completion Status

Task 5: Reporting Subtasks
☐ **Task 5.1: Monthly Status Reports**
☐ **Task 5.2: Bi-Monthly Updates**
☐ **Task 5.3: Methodology Memo**
☐ **Task 5.4: Draft report**
☐ Include estimates of free ridership
☐ Include estimates of participant spillover
☐ Include forward free ridership and spillover data
☐ **Task 5.5: Final report and presentation**
☐ Final report addressing comments on draft report
☐ In-person presentation

Objectives

DNV GL recognizes the importance of providing clear and timely reports on project progress, evaluation activities and results.

Activities

Our approach to reporting for this project includes:

- **Monthly emailed status reports:** Every month the DNV GL project manager will submit a monthly status report to the EAC, via email, which will summarize the past month's activities, notify them of the next month's activities, and report on how closely the evaluation is adhering to the original schedule. However, if there are methodological questions or delays in responses to data requests that could put the evaluation off schedule, the program manager will notify the EAC of these issues immediately for proposed resolution so that the evaluation schedule is not compromised.

- **Bi-monthly study updates to the EAC:** the DNV GL project manager will provide the EAC with study updates via teleconference on a bi-monthly basis in alignment with scheduled EAC meetings. These bi-monthly study updates will provide similar information as in the monthly emailed status reports, although the more interactive format of the teleconference should allow for greater discussion and quicker resolution of any key issues.
- **Methodology Memo:** DNV GL will produce a memo detailing the methodology and rationale for the calculations to be used in the analysis. This memo will constitute most of the methodology section in the draft report and will allow the EAC to review and comment on the methods prior to receiving the results of the analysis.
- **Draft report:** At the conclusion of the evaluation, DNV GL will submit to the EAC a draft report that will present all the information requested in the RFP's research objectives including:
    - Estimates of program free ridership factors by market sectors and precision targets for both the Enbridge and Union Gas' custom C&I programs;
    - Estimates of participant inside and outside spillover[13] by market sectors and precision targets for both the Enbridge and Union Gas' custom C&I programs;
    - Guidance on the development of a strategy for applying free ridership and spillover data collected on previous program participation to forward looking DSM program activity.

[13] Potential electric spillover will not be reported in kWh, but descriptively, as electric spillover is outside the specific scope of this evaluation.

Along with these key findings, we will also show how these estimates were derived and what data from the IDIs and CATI survey were used to inform these estimates, including any qualitative findings regarding non-incentive based utility services.

- **Final report and presentation:** After receiving comments on the draft report from the EAC members, DNV GL will produce a final report which addresses all these comments along with a comment matrix that shows how we addressed them and why. We also plan to deliver an in-person presentation of these results to the EAC and the Ontario gas utilities.

Task 6: Project Management

Table 20: Task 6 Subtasks and Completion Status

Task 6: Project Management
Task 6.1: Complete evaluation on time, on budget and within scope.
Task 6.2: Keep client informed

Objectives

Ensure timely and on-budget deliverables.

Keep clients informed of project progress.

Activities

- Meetings and status updates to PAs
- Invoicing
- Budget and workflow tracking
- Quality control
- Scope 2016 deliverable

Deliverables

- The primary deliverable from project management is the final report.
- Various other materials include weekly status reporting, invoices, monthly and bi-monthly status reports, and ongoing communication with stakeholders.

PROJECT BUDGET AND TIMELINE

The budget is denominated in US dollars. The original budget was $398,700, with the $31,000 Run-it-Right Add-on, the total is now 429,700. The add-on is listed as a separate line in the budget table and will be paid with the Analysis Methodology Memo milestone.

Table 21: Budget Summary and Milestones

Milestones	Estimated Date	Incremental (USD)	Cumulative (USD)
Contract Signed by all parties	Complete	$ 28,200	$ 28,200
Work Plan and Participant Surveys Approved	March 31, 2016	$ 65,800	$ 94,000
Analysis Methodology Memo Complete	July 29, 2016	$ 141,000	$ 235,000
Run-it-Right Add-on	July 29, 2016	$ 31,000	$ 266,000
Draft Report Delivered	September 30, 2016	$ 94,000	$ 360,000
Final Invoice (Approved Final Report/Presentation)	November 16, 2016	$ 45,778	**$ 405,778**

Our current schedule has the project completion as November 16.

Table 22. Schedule of Deliverables

Tasks	2016											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Initial Staff Interviews	✓											
Kickoff Meeting			10									
Tracking Data Merge/Cleaning												
Draft Work Plan			2									
Work Plan Comments			17									
Final Work Plan			31									
Draft Survey and IDI Instruments			17									
Survey and IDI Instrument Comments			31									
Final Survey and IDI Instruments				14								
Review Project Documents												
Data Collection												
Data Analysis												
Methods Memo							29					
Draft Report									30			
Draft Comments												
Final Report & Presentation											16	

RISKS AND CONTINGENCIES

The tables in this section document the risks to project schedule, finances and quality and the contingencies DNV GL has in place to handle them.

Table 23: Schedule Risks

Schedule Risks	Explanation	Contingency
Data Reception	Timing Controlled by Union/Enbridge. Currently have no data for Run-it-Right and no data for 2015 program year. Anticipate data in March, but unsure of exact timing.	1) Move forward with work plan without missing data. Use 2014 data to proxy 2015.
Data Processing	Categorizing and Aggregating data in a way that is meaningful to eventual respondent and in the context of the NTG analysis. Initial data has some conflicting and unclear information.	1) Use best judgment with initial data for work plan. 2) Maintain list of "judgment calls" to clarify 2) confirm and clarify based on project documentation when it arrives 3) request clarifications where project documentation does not resolve questions.
Documentation Reception	Timing Controlled by Union/Enbridge	1) Send formal documentation request with explicit, agreed upon deadline for documents needed.

Schedule Risks	Explanation	Contingency
Documentation Reviews	Projects may have considerable documentation, some of which does not have bearing on the NTG effort.	1) Establish clear guidelines for information to be reviewed 2) provide full context of evaluation, goals and information needed from project documentation to satisfy project objectives 3) Utilize engineers familiar with a) custom gas projects and b) NTG methods and interviews
Contact information Reception	Timing Controlled by Union/Enbridge	1) send worksheet for contact information request 2) include clear directions for worksheet completion, including context of what we are attempting to learn from the interviews. 3) ensure the worksheet is simple and easy to complete.
Contact information processing	Contact information may be incomplete or come in hard to use format	1) Clear directions for the request 2) use experienced analyst to prepare data for survey
Resourcing	Having the right resources available at the right time is a challenge with projects that have experienced delays	1) reserve necessary resources for project in DNV GL's internal systems. 2) keep project on schedule to avoid conflicts with other project needs. 3) keep project sponsor aware of needs and championing project
Survey House Availability	Availability at the right time is a challenge with projects that have experienced delays	1) start conversation with Nielson now. 2) identify potential backups (Malatest) in case Nielson is unable to work on project due to long delay.
Review Periods	Dependent upon OEB/EAC/TEC priorities	1) establish clear and explicit deadlines for reviews
Decision Making	Dependent upon OEB/EAC/TEC priorities	1) schedule meetings with clear agendas that have key decisions up front.
Response Rates	Response rates on surveys have been declining, which can extend the time required for data collection	1) *attempt* a census so that call order does not matter, provided number of sample units makes this manageable and within original scope size. 2) IDI rather than CATI for the most complex and large projects 3) email participants prior to call to ask for cooperation 4) send advance letter to participants prior to call to ask for cooperation

Table 24: Financial Risks

Financial Risks	Explanation	Contingency
Currency Exchange Rates	USD/CAD rates have been highly variable	Fix prices in USD.
IDI Sample Size	Attempting a census with best practice approaches (minimum number of calls for all sites, and all efforts made to increase response rates) and an assumed 50 percent response rate could mean more completed IDIs than we have budgeted for.	1) Clear concise instruments to reduce time on phone 2) Simple data entry forms to reduce time entering data 3) Use admin staff to enter data for engineers who use paper form on phone (engineer review digital data after entry) 4) Advance letters and emails to decrease number of attempts per complete 5) limited number of dedicated engineers to reduce training costs and increase efficiency on attempted calls
Survey House re-negotiation	Project delays may prompt survey house to request re-negotiation	1) exchange rate may allow increase in survey costs if survey house paid in CAD. 2) open negotiations with alternative provider 3) census may provide survey house with cost efficiencies
Resourcing	Planned resources have been promoted since project scoped and now cost more. Planned resources have left company	1) substitute with acceptable alternatives. Inform TEC of new staff qualifications.
Travel	Additional kickoff meeting was not in original scope	1) cost may be absorbed by having OEB as decision make rather than consensus based TEC.
Timeline	Longer timeline tends to use project funds more than shorter timeline	1) seek to reduce schedule delays 2) Ensure efficiency or delay non-critical work when critical path is delayed to avoid additional expense

Table 25: Quality Risks

Quality Risks	Explanation	Contingency
Response Rates	Response rates on surveys have been declining, which can reduce sample sizes, introduce uncertainty about bias and make it hard to get data from large customers who have a large effect on final result	1) attempt a census so that call order does not matter. 2) IDI rather than CATI for the most complex and large projects 3) email participants prior to call to ask for cooperation 4) send advance letter to participants prior to call to ask for cooperation
Informed Respondents	Multiple people in a business are often involved in the decision to purchase capital equipment or spend money on optimizing or maintaining existing equipment. For consistency and cost reasons a single respondent from a company is preferable to interviewing multiple people at a business about the decision. Ensuring we have a respondent who knows enough about the decision to complete the project and the influence of the program on that decision is the crucial challenge of the data collection effort	1) Clear guidelines and screening questions to determine an informed respondent 2) removal from study of un-informed respondents 3) single interview for a project may require contacting multiple people at the site to determine an informed respondent.
Engineering Estimates	Spillover estimates will be based on engineer estimates of savings for projects that were not part of a program. We expect that these projects will not have the typical amount of documentation that we see for program rebated projects. The engineering estimates will be based on respondent provided information, and in some cases may not include specific sizes or operating characteristics.	1) Engineers will be required to thoroughly document information collected from the respondents and from third party sources. Justification for savings estimates will be provided, along with values and sources of key assumptions and calculation methods. 2) A senior engineer (Tammy) will review all estimates. 3) transparently provide documentation of project savings (within confidentiality limits) in appendix of report
Analyst Experience	Since the project start, turnover in our analyst group has meant a resourcing change for this project. The planned analyst has less experience, but has proven herself capable on similar projects	1) direct oversight of analyst by PM who has performed the same work previously 2) Any further substitution will be with an analyst PM has personal experience of success working with in the past.

APPENDIX A SAMPLING PROCESS

A sample is a collection of data items such as those collected through surveys, metering or onsite observation. A sample design is required when a sample does not include the entire target population. Most sample designs are driven by cost constraints (including schedule constraints), desired precision or both. The sampling process described here ensures that all bases are covered, ensuring optimal precision around estimates of interest for the data collected. The process we followed was:

1. **Identify Goals, Methods and Constraints**: for sampling, the goals consist of identifying the primary and secondary estimates of interest: what quantitative results are most important. Defining the data collection methodology –the process used to gather the data for the analysis – and the estimation method – the approach used to calculate the primary estimate of interest – is critical for defining elements of the design. Cost and schedule constraints surrounding the data collection and analysis then determine an upper bound for the sample size.

    - **Goals**: For this study the primary estimate of interest is the NTG ratio for each program. The NTG ratio is the parameter that we are targeting for 90/10 precision for each program.

      As will be described later in the methodology memo, we calculate the NTG ratio as

      NTG = (1-FR)(1+SO).

      Since spillover tends to be small, this formulation is mathematically very close to the simpler formula indicated in the recent Ontario evaluations

      NTG = 1-FR + SO.

      We prefer the multiplicative formula as a more complete expression of the relationship between free ridership and spillover.

      Previous work in Ontario indicates that free ridership is on the order of 10% to 60% across program segments, 50% overall on a savings-weighted basis. Spillover is on the order of 5%. Because spillover is generally small, the precision of the full NTG will in most cases be close to that of the net-of-free rider factor, even with a modest spillover sample size.

    - **Methods and Constraints:** We are using two data collection methods, each of which have different costs associated. Due to cost constraints we must limit our use of in depth interviews to those projects where it will make the most difference in the estimate: we have budgeted for 132 IDIs and these will be deployed on the largest and most complex projects as identified based on tracking data descriptions. CATI surveys will be used to collect the balance of the data that we do not have the funds to collect with IDIs. For smaller and simpler projects where the decisions made are more straight forward, CATI surveys provide accurate data at a reasonable cost..

2. **Define the unit of analysis**: The unit of analysis is the level at which final estimates will be made. Some studies have multiple units of analysis: process evaluation results may be based on respondent level estimates, while impact evaluation results may be based on measure or project level estimates. Sampling units do not need to be the same as the unit of analysis, but identifying both early is crucial.

For these programs we are recommending a unit of analysis that is a measure type at a site in a given year. We are using the same definition for our sampling unit. Most customers have no more than three projects in a given year, and most projects are of only one or two measure types, so that we will be able to inquire about all of these in a single survey or interview of reasonable length.

We plan to ask each sampled customer about attribution for all of the customers measures. The handful of customers with more than three measures will be included in the IDI sample frame in order to handle their complex projects.

For customers with large numbers of projects and measures, we will ask about groups of measures or projects. The groupings will depend on details of the types of measures and savings magnitudes. We will select a subsample of three groups with probability proportional to size. Typically this will mean asking about two groups that account for the large majority of savings, and a third smaller one selected at random.

3. **Identify the target population:** The target population is the universe of items that inferences and estimates are desired for. For this evaluation the primary target population is future programs of the same type. Having future program years as the target population has two implications for the sample design. First, the applicable error associated with our estimates is the non-finite population corrected error (described in our discussion of sample size below) which requires larger sample sizes for a given precision. Second, analysis by sub-domains such as measure types within the programs becomes more important. The measure mix in programs changes from year to year and typically NTG varies more across measure types than within. For more accurate estimates of net savings for future program years, applying measure type NTG ratios will be preferred to program as a whole NTG ratios.

4. **Establish the Sample Frame:** The sample frame refers to the list or mechanism from which the sample is drawn. A perfect frame will match the target population exactly.

   Since the target populations of this study are the future programs, we will not have a perfect sample frame; however, if the program designs remain relatively stable, using past program participants as the sample frame will provide a good list from which to draw our sample.

5. **Determine sample size:** Sample size refers to the number of items that are selected from the sample frame in order to draw inferences and create estimates about the target population. In stratified designs, sample sizes are determined for each stratum.

   Critical to the sample size determination is the error ratio for each sampling cell with respect to the ratio to the estimated. The error ratio for ratio estimation is the equivalent of the coefficient of variation for estimation of a population mean. Our experience with conducting similar NTG studies of commercial-industrial customers is that the error ratio for the free rider NTG factor is between 0.7 and 0.8 within reasonably defined sampling cells.

   In determining these sample sizes, the number of customers in the full population is also important for two reasons. First, if we are trying to estimate a parameter for a finite population, the sample size required is reduced by the Finite Population Correction or FPC. Second, we need to consider the number of completed surveys we can realistically complete given likely response rates.

Use of the FPC is appropriate when the parameter of interest represents a particular population. This situation applies when we are determining the free ridership factor or spillover rate for a particular program and time frame. When we determine these factors for all future theoretical projects, it is arguably more appropriate to treat the sample drawn from recent participants as coming from an essentially infinite population. Thus, for projection to future years we generally recommend against applying the FPC.

Because we recommend against applying the FPC and we anticipate response rates of 50 percent for our IDIs and 25 percent for our CATI surveys, we recommend *attempting* a census of participants[14]. This will allow for faster data collection as we will not need to maintain a strict call order and will result in the most completes possible for the data collection methods used.

6. **Stratification:** Stratification is the partitioning of a target population. Stratification is often introduced in a design for two reasons:

   When one desires a specific sample size within small groups of the target population, the groups are often used as a stratification variable. For example, the EAC is interested results by measure type, so measure type is being included as a stratification variable in order to obtain a specific number of selected units in each measure type.

   Stratification is also used in a design to increase precision. A sample design is optimized when strata can be formed so that the variability of the primary and secondary outcome measures are as small as possible within strata and as large as possible between strata. We optimized the sample design's size-based strata (m^3) using a model based optimization algorithm appropriate for ratio estimation. Optimization based on size ensures more data collected from large sampling units, which improves the precision of the estimates.

7. **Sample Selection:** Sample selection refers to the process of obtaining the sample of units from the sample frame. If all units on the sample frame are selected then the design is referred to as a census or certainty sample. Otherwise units may be selected either randomly or nonrandomly, depending on the evaluation goals, constraints and amount of acceptable bias. The sample selection process is a critical feature of the sample design and has a direct impact on the expected precision and bias of estimates. The optimal sample selection process for a particular project can vary greatly.

8. **Unit and Item non-response** Unit and item nonresponse are potential sources of bias, depending on the nonresponse mechanism and the level of nonresponse encountered. Unit nonresponse refers to the absence of information from an entire sampled unit. Item nonresponse refers to the situation where some data are collected, but not all, from a sampled unit. The nonresponse mechanism refers to the process that is causing the nonresponse. If the probability of responding depends on the data items being sought then the nonresponse mechanism is said to be nonignorable. Otherwise it is called an ignorable nonresponse mechanism. Nonresponse bias tends to be greater when the nonresponse mechanism is non-ignorable and as levels of item nonresponse increase.

[14] DNV GL will attempt a census if total size falls within the original scope. If the number of participants provides too great a sample size for the established scope, sampling will be used.

There are various ways to address nonresponse in a sample. For example, weight adjustments are often used to account for unit nonresponse and item imputation techniques are often used to account for item nonresponse.

If nonresponse levels are low and the response mechanism is thought to be ignorable then one could ignore nonresponse and simply create estimates among the respondents.

We recommend treating unit nonresponse as ignorable for this study since it does not depend on the data items being sought. Instead, it depends on the willingness of the decision maker at the participating business agreeing to respond to the survey.

For item nonresponse in the scored portion of the surveys we recommend treating the nonresponse as nonignorable if all three of the T,E,Q portions of the free ridership sequence contain non-response. Otherwise we plan to treat the item nonresponse as ignorable and will impute the average response for the missing item from among scored units of the same measure type and utility. The exception to this rule is when we find conflicting responses in our QC of the data collection that indicates the nonresponse is nonignorable. For nonignorable item nonresponse we will drop the unit from the analysis.

9. **Expansion** Sample expansion refers to the process of extrapolating results from a sample back to the target population of interest. Often times this is done using a sample weight. The weight is a numeric quantity associated with each responding unit and conceptually represents the amount of the target population the responding unit represents during the analysis. The sample weight is some function of the total number of units on the sample frame.

   The sample weight for our analysis will be built from the inverse probability of selection, incorporating additional adjustment factors to account for nonresponse and coverage errors. The sample weight will be utilized along with the "size" of the unit (energy savings) to expand results using ratio estimation, as described in the ratio estimation appendix of this work plan.

10. **Domains of interest:** Often times, estimates for an entire target population are of interest, but so are estimates for various subgroups. Subgroups may or may not overlap. Identifying the population domains of interest is another critically important design feature because it affects the decisions being made about other design features, such as the desired sample size, stratification variables and primary and secondary estimates of interest.

We are providing the EAC with estimated precision for domains of interest in the next section of this work plan. After EAC review of the draft work plan, we can add adjust the definitions of the domains of interest to best reflect the level at which the EAC is likely to want results presented in the final report.

APPENDIX B NET-TO-GROSS METHODOLOGY

The Ontario DSM Guidelines define a free rider as "a program participant who would have installed a measure on his or her own initiative even without the program." [15]

A great deal of attention has been given to the challenges of "scoring" attribution surveys. In DNV GL's free ridership approach, we use a critical set of lead-in questions to establish the framing, determine that we have the right respondent, and clarify what measure is being asked about. We then have essentially one question each identifying the effect of the program on the efficiency, the quantity, and the timing of the measure installed. We include some cross-checks; if an inconsistency is identified in these checks we probe to resolve that inconsistency.

DNV GL has developed a streamlined and effective approach to these question sequences. While many of the set-up questions are not used explicitly in calculating measure free ridership, our experience is that dispensing with these framing questions, or attempting to compress the scored questions into a more general subset, results in responses of ambiguous meaning.

Other practitioners prefer to ask the same question multiple ways and then average the corresponding responses. We find this approach typically means blending a looser question with a tighter one, and also increases response burden. We prefer to ask each needed element one way, with appropriate framing and wording to ensure meaningful responses, and to probe as needed.

A frequent challenge in this context is how "don't know" responses are treated. We typically find that with well framed questions addressed to appropriate respondents, "don't know" responses are rare, on the order of 5 to 10 percent. As a result, our overall estimates are not highly sensitive to how these cases are treated. If a respondent gives a large number of don't know responses, we treat that survey as essentially uninformative.

The outcome of our free ridership analysis for a particular respondent and measure is the net program-attributable savings for that measure. This net savings takes into account

- The program may get credit for part but not all of the energy efficiency improvement
- The program may get credit for some but not all of the units installed
- The program may get credit for accelerating the timing of the measure implementation, with or without getting credit for increased efficiency or quantity.
- For a complex project, the program may get credit for some elements of the project, and not for others.

This approach treats free ridership as a fraction of gross savings, for both individual measures and for the program as a whole. DNV GL believes this is a more meaningful approach than attempting to classify each participant, project, or measure as a free rider or not. An excerpt from a prior report detailing the survey approach and associated calculation rules are provided in Appendix C.

Likewise for spillover, after collecting information on what additional measures were implemented based on experience with a program-attributable measure, we determine the savings associated with these measures via engineering analysis.

[15] Ontario Energy Board *Demand Side Management Guidelines For Natural Gas Utilities,* EB-2008-0346, June 2011, Chapter 7.

Interpreting Customer Responses on Program Effect on Timing.

There are two general ways to treat survey responses indicating that the program caused a measure to be implemented sooner than it otherwise would have. DNV GL has tools and procedures for handling both of these approaches, with a range of specific for either.

Scaling based on reported acceleration

One way to treat the statement that the measure would otherwise have been implemented x months or years later is essentially like a scaling or probability factor. If the measure reportedly would have been implemented within a very short time absent the program, it's highly likely that it would indeed have been implemented. If the measure reportedly would have been implemented a long time out, it's less certain that it ever would have been implemented. Accordingly, attribution is scaled down if the reported timing acceleration is very short, but scaled down less for greater acceleration. The simplified version of this approach gives no credit if the measure would have been done within say 1 or 2 years, and full credit thereafter. An approach DNV GL has used for multiple programs is to give full credit if the reported acceleration is greater than 4 years, and scale the credit linearly between 0 months and 4 years.

We will be using 4 years as our standard for this project.

Dual baseline

The second general way to account for acceleration is to take the reported acceleration at face value, and recognize a different baseline condition before and after the acceleration period. For example, if old equipment would otherwise have been replaced 2 years later, the baseline for those first 2 years is the old equipment. For the remainder of the measure life, the baseline is the efficiency that would otherwise have been installed at that point.

Even with the dual baseline approach, we recommend disregarding reported acceleration greater than 4 or 5 years, since customer investment plans are unlikely to be determined that far out. With the dual baseline approach, the attribution factor is the ratio of the total net savings over the life of the measure to the total gross savings over that period.

We will not be using the dual baseline approach on project: TEC agreed on using Y1NS method after the kickoff meeting.

Determining Attribution Parameters for the Program.

Once we have determined the program-attributable savings for the program measures for each surveyed customer, we calculate the in-program attribution rate by sample expansion and ratio estimation. That is, we calculate the ratio estimator

$$NTG_{FR} = (\text{Net Savings})_{FR}/(\text{Gross Savings})_{FR}$$
$$FR = 1\text{-}NTG_{FR}$$

Where

NTG_{FR} = net-to-gross ratio considering free ridership only (not spillover)
$(\text{Net Savings})_{FR}$ = estimated program non-free rider savings, from expanding the FR survey sample
$(\text{Gross Savings})_{FR}$ = estimated program gross savings, from expanding the FR survey sample.
FR = free ridership as a fraction of program gross savings.

Likewise for spillover (SO):

SO = (Spillover Savings)/(Gross Savings)

(Spillover Savings) = estimated total spillover savings, from expanding the spillover survey sample

$(\text{Gross Savings})_{SP}$ = estimated program gross savings, from expanding the spillover survey sample.

Overall NTG is then calculated as

NTG = (1-FR) x (1 + SO).

APPENDIX C SPILLOVER METHODOLOGY

Spillover "refers to effects of customers that adopt energy efficiency measures because they are influenced by a utility's program-related information and marketing efforts, but do not actually participate in the program."[16] As in many jurisdictions, Ontario's Demand-Side Management Guidelines recognize the importance of spillover in determining program benefits, and also require "comprehensive and convincing empirical evidence" to support any program spillover claim.

Key challenges to providing convincing quantified evidence of spillover for a particular customer include:

- Determining that a particular subsequent action was due to the influence of the program
- Confirming that the action was not taken as part of the original or another program, hence already counted by the program
- Quantifying the savings associated with confirmed spillover actions.

DNV GL's proposed approach provides a high level of rigor to address each of these issues.

- We determine program influence using participant surveys that start with the framing of our free ridership questions, and the identification of the influence of the program on the original measures. This framing helps ensure more meaningful responses to questions of the influence of the original measure on subsequent actions. As for the free rider surveys, obtaining the right respondents is also essential to obtaining meaningful responses to these questions.

- We confirm that the actions tentatively identified as spillover were not already counted by another program by cross-checking tracking data bases. Also critical to separation of spillover from program-claimed savings is understanding what savings if any are claimed by the programs for facilitation support such as opportunity identification, feasibility studies, audits, and related continuous improvement program engagement.

- We quantify the savings for confirmed spillover actions by collecting engineering specifications and calculating associated savings. This approach gives more accurate results than asking customers to estimate the magnitude of spillover savings relative to the original measure.

Thus, our participant spillover methodology addresses the following key issues:

- *Locating the right decision-maker* - Large commercial and industrial companies have multiple decision-makers and it is often difficult to find someone who is familiar with both the tracked program-influenced measure and the spillover measure. Employee turnover can also complicate this. Our approaches to ensure appropriate respondents are discussed above.

- *Avoiding double-counting* – Companies that received financial incentives from an energy efficiency program for one measure are likely to seek these incentives for future measures. Hence it is important to get the program's latest tracking data to make sure that a potential participant spillover measure did not receive program support.

- *Estimating program attribution for potential spillover measures* - A common way of assessing participant spillover is to ask how much the participant's experience with the tracked program-influenced measure influenced their decision to implement measures that are candidates for spillover

[16] Ontario Energy Board *Demand Side Management Guidelines For Natural Gas Utilities,* EB-2008-0346, June 2011, Chapter 7.

attribution. It is difficult to turn this "fuzzy" assessment of program influence into a more concrete attribution factor necessary for attributing a certain quantity of therms from the spillover measure to the program.

- *Estimating the energy savings for the participant spillover measures.* Because spillover measures occurred outside the program, evaluators do not have access to the same information about the size, type, and quantity of the implemented energy-efficient measures that they would find in a program tracking database.

Our approach to these issues is described in more detail below. This approach is based on one we used successfully in Wisconsin C&I programs over many years.

Understanding Energy-Related Standard Practices

The first objective of the survey will be to find out whether the participant's company or organization had installed any energy-efficient equipment or made any energy-efficient changes in operation or maintenance (O&M) procedures after the implementation of the tracked project. But before doing that we will collect some information about the company's or organization's energy-related decision-making process. We will ask the participants a series of questions about:

- Who in their company makes decisions about equipment replacement and retrofit projects;
- What information sources are used in making these decisions; and
- Possible barriers to energy efficiency implementation.

This information will be valuable for a number of different reasons. First, it should help program implementers devise strategies for increasing program awareness and mitigating barriers to project implementation, especially for participants who did not identify any subsequent energy-efficient projects after the tracked project. Second, by shedding light on the project decision-making process, it should help the evaluators make better judgments about assigning program attribution to a given project. Finally, it should make the survey appear less peremptory for those who did not report any new energy-efficient projects after the tracked projects, since otherwise their survey would be terminated fairly quickly.

After we collect this information about participant energy practices, we will ask the participants whether their company/organization had installed any energy-efficient projects after the installation of the tracked project. If the participants report no subsequent actions, we will terminate the survey since there is no participant spillover to be measured. If they do identify subsequent projects, then we will collect some basic information about the project including:

- The approximate year of the project;
- The geographic location of the project (e.g. city);
- The types of energy-efficient measures installed or energy-efficient O&M practices implemented; and
- Whether the tracked project and the subsequent project were in the same facility or not (needed for the calculation of inside vs. outside spillover).

Because this information will be collected by CATI program surveyors who do not have an energy background, we will not ask them to try to collect too detailed information about the energy-efficient project. It just needs to be detailed enough to allow the evaluators to make a reasonable match with any projects in the program tracking data.

Calculating Program Attribution for Candidate Spillover Actions

The next stage of the survey will focus on program attribution. Our method only awards spillover energy savings if two criteria are met:

1. The original tracked project is at least partially attributable to the program (Attribution Factor A).
2. The subsequent project is at least partially attributable to the participant's experience with their earlier tracked project (Attribution Factor B).

If a measure met these two criteria, we assign it spillover savings according to the following formula.

(Spillover Savings) = (the measure's annual savings) X (Attribution Factor A) X (Attribution Factor B).

We apply both Attribution Factor A and Attribution Factor B because if the program had no influence on the original tracked project, the program should not get credit for any additional measure installations resulting from that tracked project. To reduce respondent fatigue, if Attribution Factor A is zero (a total free rider) we will not ask them the questions for calculating Attribution Factor B.

To determine attribution factor A we will use the NTG question battery already described in this proposal. For Attribution factor B we will use a scoring method that will be triggered off the question, "If you had not made the earlier energy-efficiency improvements I just listed, how likely would you have been to make this additional energy efficiency improvement?" The scoring method, which we used in Wisconsin for many years, is shown in Table C-1. If the participant said they were very likely to have made the additional energy efficiency improvement without the program, then we will terminate the survey since there will be no participant spillover to be measured.

Table C-1: Program Attribution for Subsequent Measures

If had not made tracked program-influenced energy efficiency improvement, reported likelihood of making subsequent energy efficiency improvement	**Assigned Attribution Factor B**
Very likely	0.00
Somewhat likely	0.55
Not very likely	0.90
Very unlikely	1.00

The reason we use a different method for Attribution Factor B than for Attribution Factor A is that the character of influence is different. For the program's influence on the tracked project (Attribution Factor A) financial incentives usually account for much of the influence in terms of reducing payback periods and therefore we want to measure things like acceleration effects. However, with participant spillover the influence is less tangible and more likely to be general positive experience with a new energy-efficient technology and the energy savings it produces. We believe that using a Likert scale question will better capture the less tangible character of this type of influence.

Avoiding Double Counting of Energy Savings

Once a participant has identified a subsequent project that is attributable – e.g. one where Attribution Factor A and Attribution Factor B are both greater than zero -- then we will conduct some additional checks to insure that the subsequent project is not also a tracked project. Some of these checks will occur in the survey itself. For example, we will ask the participants if they recall receiving financial incentives from an energy efficiency program for the subsequent projects. We will also examine the program tracking data to make sure that the subsequent project is not in the tracking program data for future years. For example, if we interview a 2011 participant and they identify a subsequent project in 2013 we will look at the 2012-2013 program tracking data (we will look at both program years in case their memory of the project timing was faulty) to see if we can find that project. If we do find the subsequent project in program tracking data, then we will remove that project as a candidate for spillover energy savings since the savings for that project has already been claimed by the program.

Estimating Energy Savings for Participant Spillover Measures

Once a project has been identified as having spillover energy savings (it is program attributable and we could not locate it in the program tracking data) the final step will be to estimate its energy savings. To estimate the annual energy savings for participant spillover measures, we plan to have engineers conduct follow-up interviews with the persons identified in the CATI surveys as being most familiar with the spillover projects. The engineers will have some basic project information collected from the CATI survey as well as some information about deemed savings algorithms for that measure which will allow them to prepare ahead of time the types of questions they will need to ask (e.g., about baseline measures, hours-of-use, etc.). Once they have conducted the interview and collected the necessary information they will calculate the first year savings for the measure. If a deemed savings algorithm exists for that measure they will use that as a default. If none exists then they will use their best professional judgment to estimate the energy savings.

The final step will be separating the spillover energy savings estimates that were reported for "inside" facilities vs. those reported for "outside" facilities. These savings estimates will then be used to produce the inside and outside spillover energy savings estimates for the report.

APPENDIX D PROJECT TASKS AND SUBTASKS

Task 1: Project Kickoff	
☒	**Task 1.1: Convene a project kickoff meeting**
☒	**Task 1.2: Reach a consensus on methodology**
Task 2: Sample Design	
☐	**Task 2.1: Data Exploration**
☒	Initial data exploration , Union and Enbridge
☐	Exploration of the full datasets, Union and Enbridge
☐	**Task 2.2: Define the Unit of Analysis**
☒	Initial unit of analysis definition
☐	Final unit of analysis definition using full datasets
☐	**Task 2.3: Stratify the Data**
☒	Initial stratification
☐	Final stratification using full datasets
☐	**Task 2.4: Design the Sample**
☒	Initial sample design
☐	Full sample design and precision optimization
☐	**Task 2.5: Prepare the Sample Frame**
☐	Sample contact information and documentation request
☐	Prepare the sample frame
Task 3: Data Collection	
☒	**Task 3.1: Program Managers and Staff Interviews**
☒	Union Gas Program Portfolio Management
☒	Enbridge Commercial Program Managers
☒	Enbridge Industrial Program Managers
☒	Enbridge Run-It-Right Program Managers
☐	**Task 3.2: Program Energy Solutions Consultants Interviews**
☐	Energy Solution Consultant Interview Guide
☐	10 pre-survey interviews
☐	10 follow up interviews
☐	**Task 3.3: Program Participant CATI Survey**
☐	CATI survey Instrument
☐	## CATI survey interviews completions attempted
☐	**Task 3.4: Program Participant In-Depth Interviews**
☐	In-Depth Interview Instrument, mirroring CATI instrument
☐	## IDI completions attempted
☐	**Task 3.5: Program Participant Engineer Interviews**
☐	**Task 3.6: Participating Vendor In-Depth Interviews**
☐	In-Depth Interview Instrument
☐	80 IDI completions attempted

Task 4: Data Analysis Subtasks
☐ **Task 4.1: Analyze survey and interview data**
☐ Sample frame data transformation
☐ Sampling weight
☐ Data validity check
☐ **Task 4.2 Calculate estimates**
☐ Attribution
☐ Spillover
☐ Net-to-Gross
Task 5: Reporting Subtasks
☐ **Task 5.1: Monthly Status Reports**
☐ **Task 5.2: Bi-Monthly Updates**
☒ **Task 5.3: Methodology Memo**
☐ **Task 5.4: Draft report**
☐ Include estimates of free ridership
☐ Include estimates of participant spillover
☐ Include forward free ridership and spillover data
☐ **Task 5.5: Final report and presentation**
☐ Final report addressing comments on draft report
☐ In-person presentation
Task 6: Project Management
Task 6.1: Complete evaluation on time, on budget and within scope.
Task 6.2: Keep client informed

ENERGY

Net to Gross Evaluation

Ontario's Natural Gas Custom Commercial and Industrial DSM Programs

10 March 2016

Here with You Today

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Agenda

- High Level Overview
- Net vs Gross Reminder
- Work Plan
  - Kickoff Decisions
  - Sampling
  - Data Collection
  - Data Analysis
  - Next Steps/Timeline
  - Risks

High Level Overview

Objective

"The overall goal of this evaluation is to develop transparent free ridership and spillover factors for custom commercial and industrial programs, to be used for future programs."

Project Organization

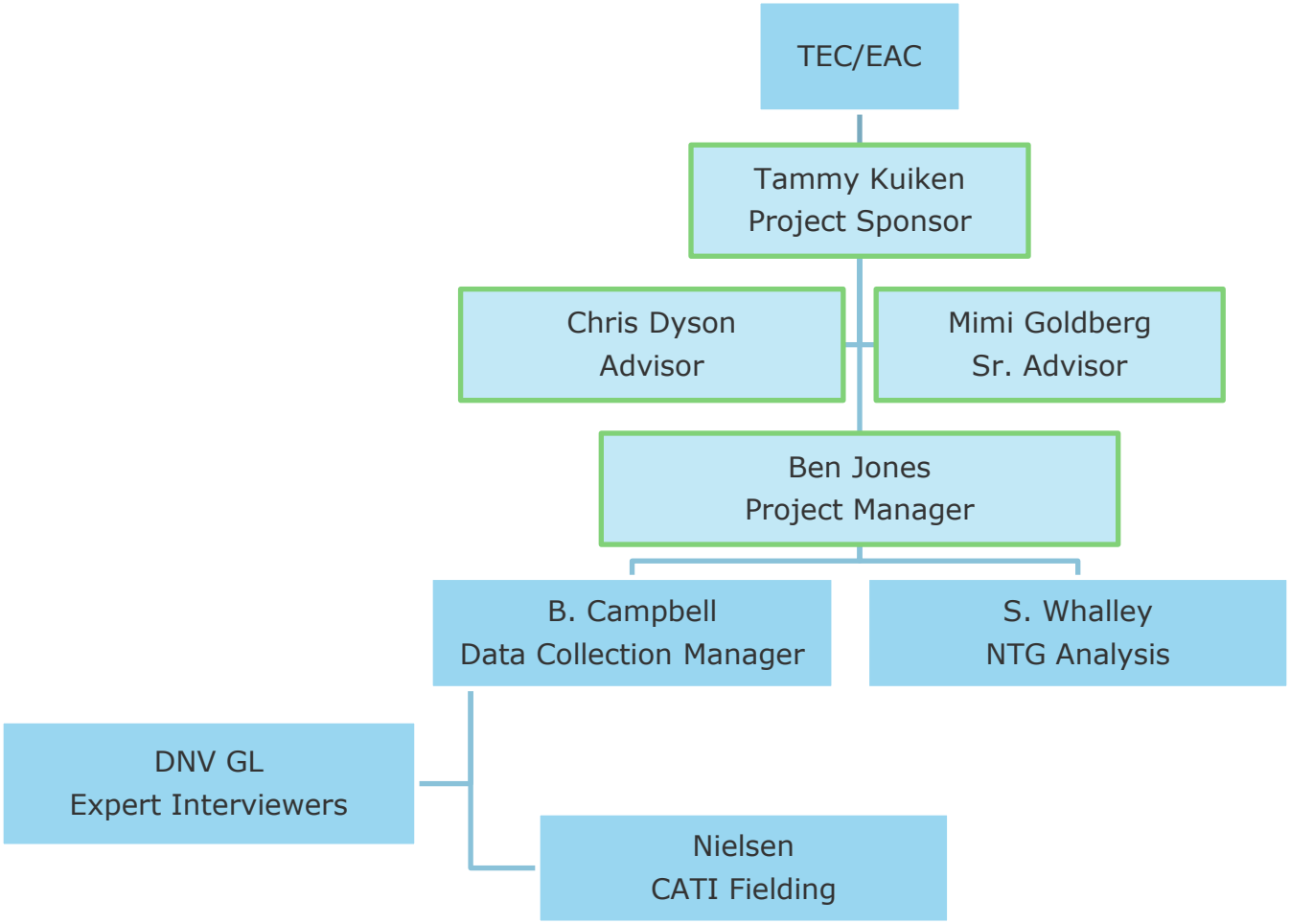

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Exhibit B.Staff.5
Attachment E
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Custom C&I Resource Acquisition Programs

Union

- Large Volume/Direct Access
- Commercial and Small Industrial

Enbridge

- Industrial
- Commercial
- Run-it-Right

High Level Approach

Free ridership

- End user self reports
- Supplemented with vendor interviews
- 2014 and 2015 program participants

Spillover

- End user self reports
- Engineer estimates to make savings concrete
- 2013 and 2014 program participants

Overview of Project Tasks

Key Tasks	
☒	**Task 1: Project Kickoff**
☒	Convene a project kickoff meeting
☒	Reach a consensus on methodology
☐	**Task 2: Sample Design**
☐	Explore the tracking data
☐	Define the unit of analysis
☐	Stratify the data
☐	Design the sample
☐	Prepare the sample frame
☐	**Task 3: Data Collection**
☒	Interview program managers and staff
☐	Interview program Energy Solution Consultants (ESC)
☐	Survey program participants
☐	Interview large or complex program participants
☐	Interview program trade allies
☐	Conduct follow-up interviews with program participants
☐	**Task 4: Data Analysis**
☐	Analyze survey and interview data
☐	Calculate estimates
☐	**Task 5: Reporting**
☐	Produce an evaluation report identifying free ridership and spillover factors for custom commercial and industrial programs
☐	**Task 6: Project Management**
☐	Complete evaluation on time, on budget and within scope
☐	Keep client informed on progress

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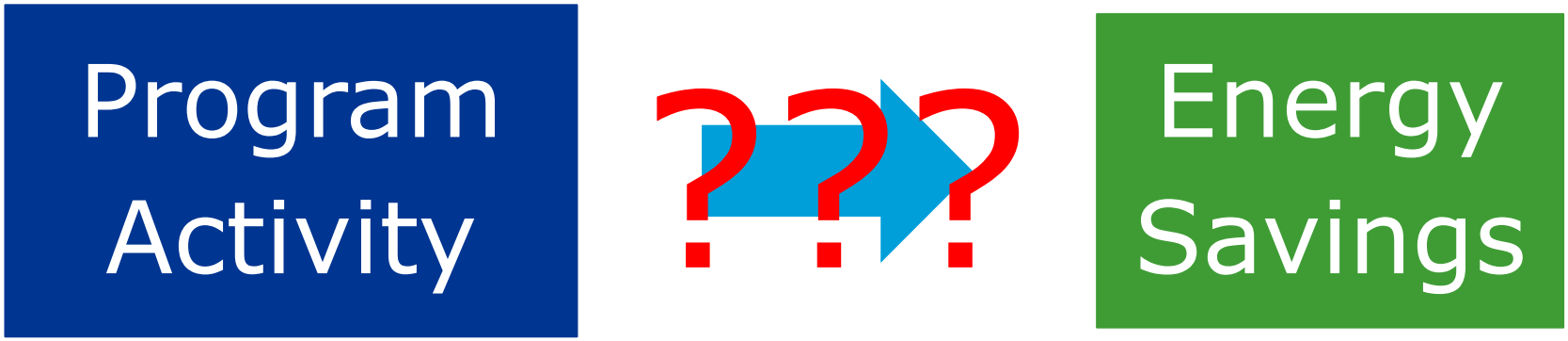
Logistics and Schedule

Month	Task	EAC/Staff Task
January	General program staff interviews	Interviews
March	Receive final tracking data	Data
March	Final sample stratification	Review Plan
April	Program documentation/Contact Info	Data, verify contacts
Mar-Apr	Write survey, advance letter & send	Review guides
Apr	Assign collection method and interviewer	
Apr	Project-specific utility staff interviews	Interviews
May	Participant CATI and IDI	
Jun	Vendor and SO IDI (where necessary)	
Jul	FR and SO analysis	Review memo
Sept	Draft report	Review
October	Final report and presentation	

Net vs Gross

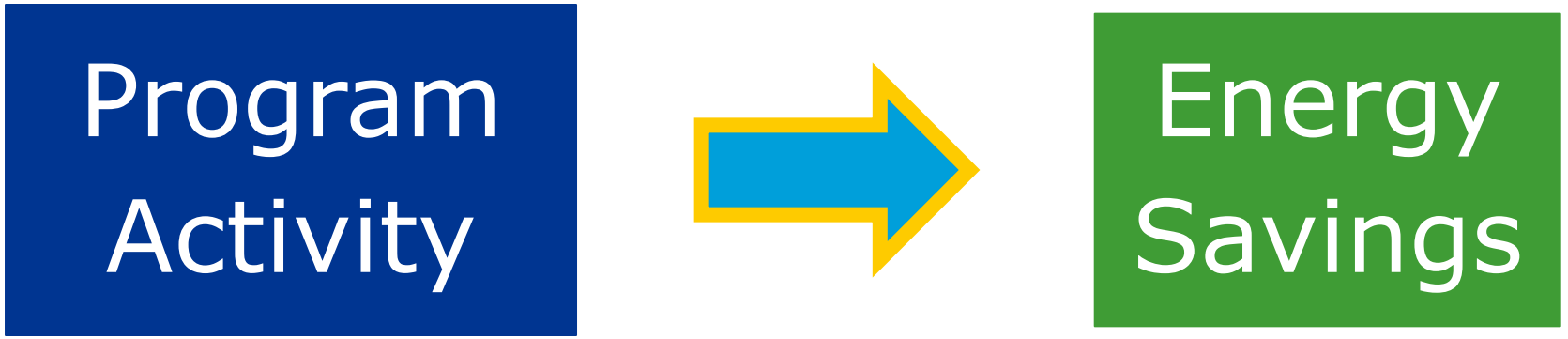
Gross Impacts

- Impact on the customer energy demand compared to what they would otherwise have used
- *Does not matter why* they implemented measure

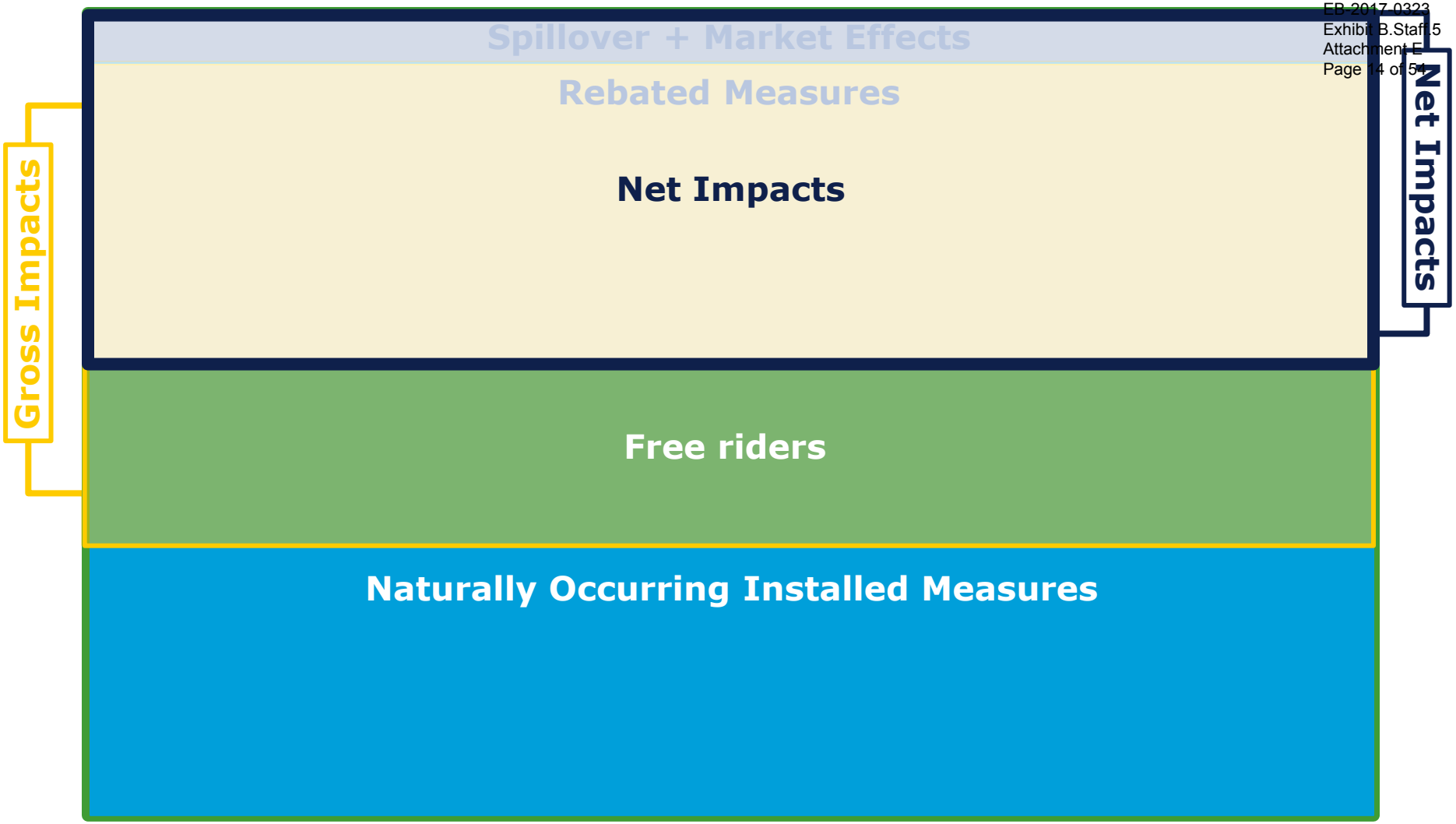


Net Impacts

- Changes attributable to an EE program
- Impact of the program on energy demand
- *Does matter why* they implemented measure



EE market for a measure with a program (not to scale)



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Quick Definitions

- **Free ridership:** tracked program savings that would have happened without the program
- **Spillover:** untracked savings from actions taken outside the program that would not have happened without the program
  - Inside Spillover: at the same site as the original program measure
  - Outside Spillover: opposite of inside spillover
  - Like Spillover: the same measure type as the original program measure
  - Un-like Spillover: opposite of like spillover
- **Market Effects:** untracked savings from a change in market structure or behaviour of market actors that is causally linked to (previous) program market interventions

Task 1: Project Kickoff

Task 1: Kickoff Review

- Original Kickoff: March 17, 2014
- Follow up Memos
  - Kickoff Memo: April 1, 2014
  - Parking Lot Memo: June 12, 2014
  - Attribution Method Comparison: July 2, 2014
  - 2nd Update to Parking Lot Memo: July 16, 2014
  - 3rd Update to Parking Lot Memo: June 9, 2015
  - Draft Workplan: March 4, 2016

Key Decisions

- **Consensus around primary project objective.** The primary objective of this project is a transparent, reputable study that produces strong, credible, and defensible NTG ratios to be used on a go-forward basis. (4/1/2014)
- **Concern about scope creep.** The potential for scope creep, particularly analysis and reporting of information collected, but not part of the NTG estimation, is a concern of several members of the TEC and evaluation team. (4/1/2014)
- **Consensus for TEC review of data collection instruments.** DNV GL will submit survey instruments, along with probes, question rationale and scoring to the TEC. (6/12/2014)
- **Consensus for qualitative reporting of participant decision making reasons.** DNV GL will include qualitative discussion of participant-reported reasons for results describing NTG and spillover analysis results. (6/12/2014)
- **Stratification determined by DNV GL.** Stratification of survey participants will be representative, as determined by DNV GL's expert judgment. (6/12/2014)
- **First Year Net Savings (Y1NS) method recommended.** DNV GL recommends the use of the Y1NS method for the current NTG study. The LCNS method requires engineering calculations that would add additional scope to the standalone NTG study. (7/2/2014).

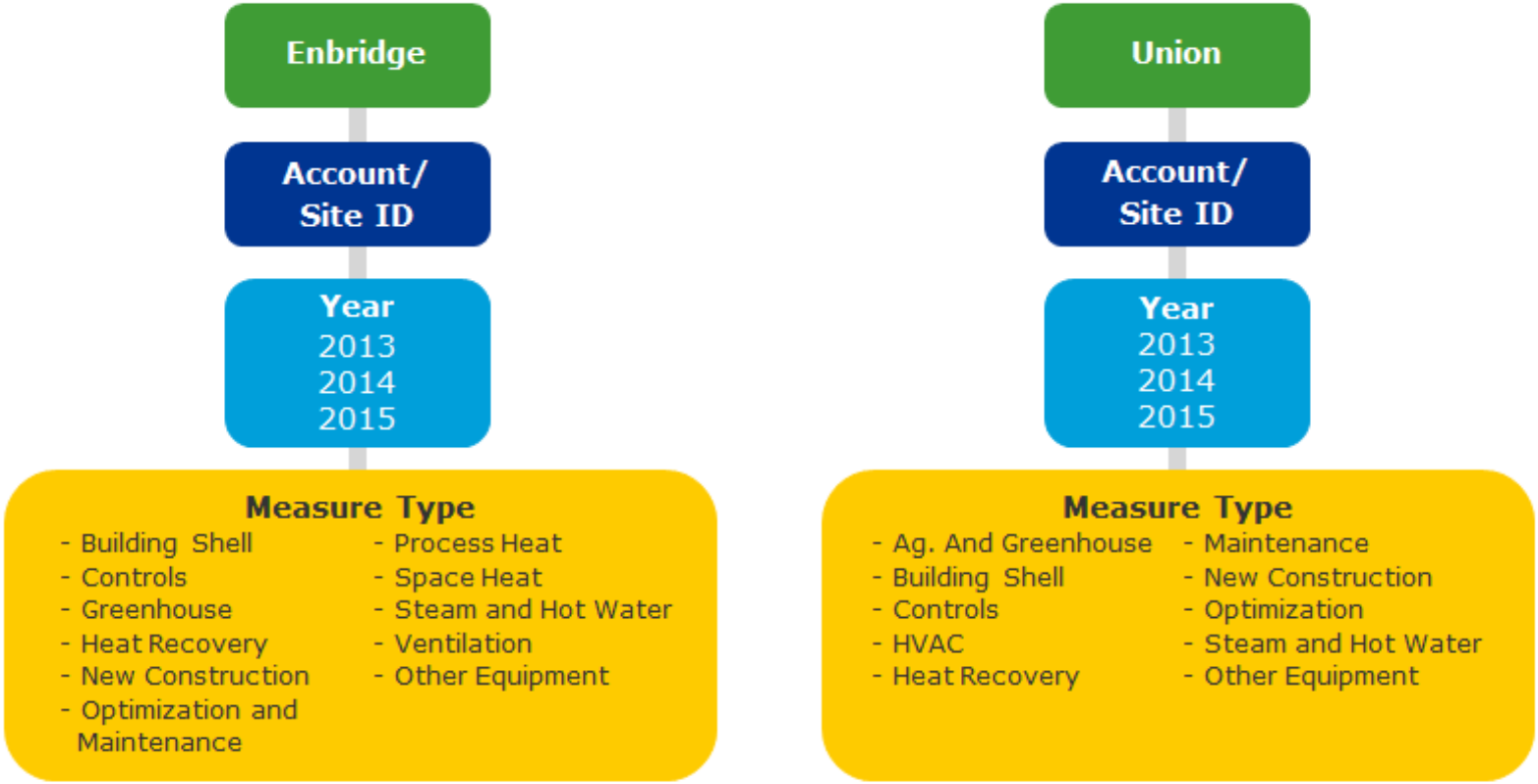
Task 2: Work Plan (Sampling Plan)

Task 2: Sample Design

- Define the unit of Analysis
- Preliminary stratification

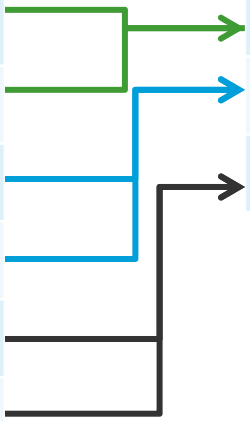
Define the Unit of Analysis

- A measure type installed at a specific site in a program year



Unit of Analysis Example

Acct ID	Year	Measure	Measure Type
A	2013	Steam Bldg A	Steam
A	2013	Steam Bldg B	Steam
A	2013	Insulation	Shell
A	2013	Door	Shell
A	2014	Door	Shell
A	2014	Insulation	Shell



Acct ID	Year	Measure Type
A	2013	Steam
A	2013	Shell
A	2014	Shell

Note that while the analysis level is "shell" when we talk to the customer we will reference the detail of the measures in the questions:

"Please tell me about your decision making process for the <insulation and doors> you installed in <2014>…"

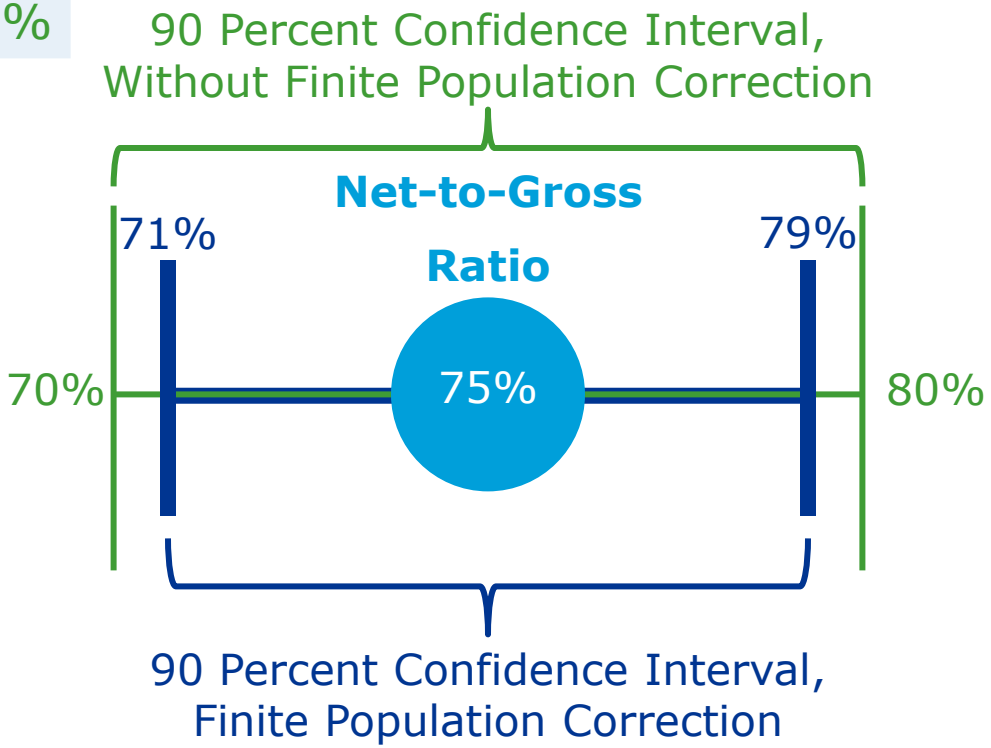
Constraints: Precision

- 90/10 Precision
  - 90% confidence
  - 10% relative precision
- Targeted for each utility and program
- "Go Forward" basis means no FPC

Finite Population Correction

Type of Error	NTG Ratio	+/-	Relative Precision
W/ FPC	75%	4%	5.3%
W/O FPC	75%	5%	6.7%

Finite Population Correction is appropriate for an error estimate based on a sample from the population studied where the population size is known.



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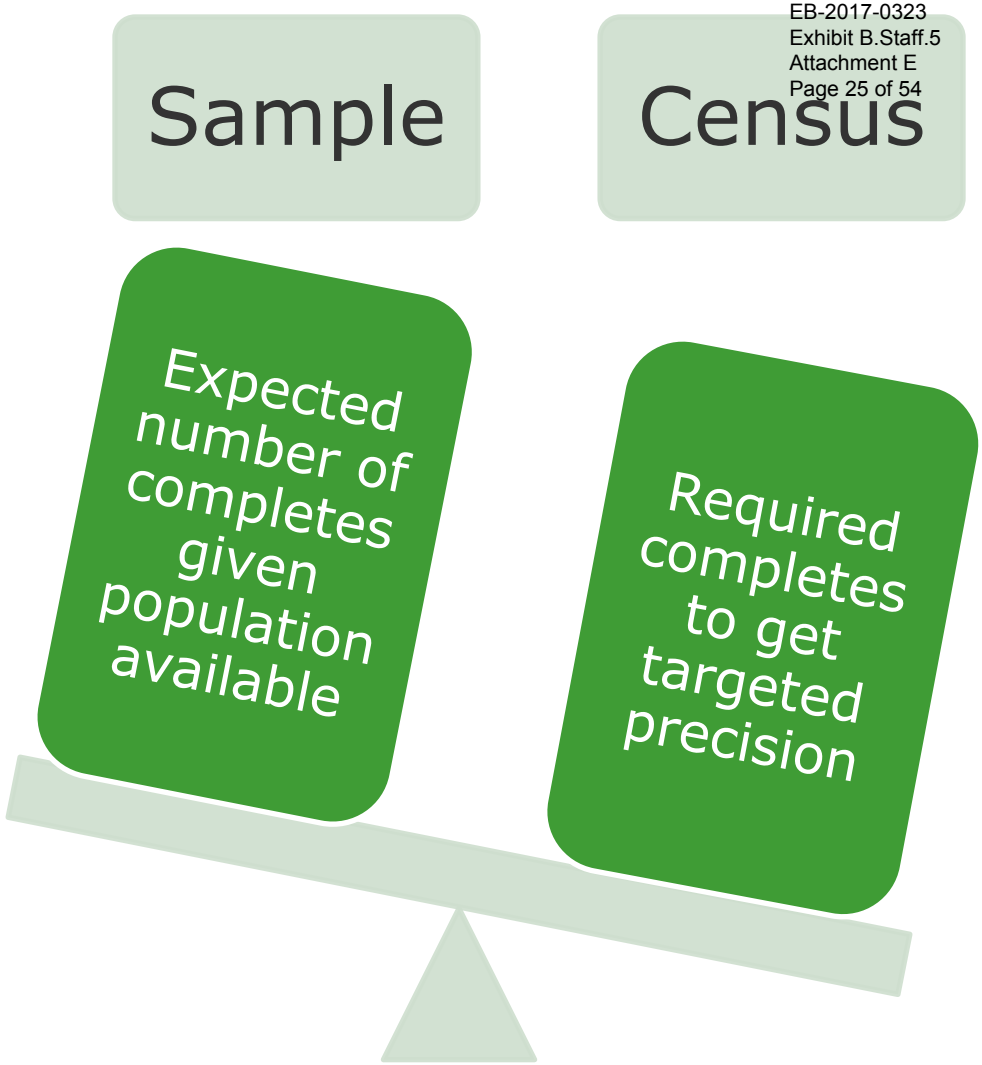
Why Attempt a Census?

- Targeted completes to get required precision > Expected completes given population and response rate

Declining Response Rates

- CATI with C&I program participants: 30%
- IDI with C&I program participants: 50%
- Time lag and Informed respondent screening
  - Turnover at participating firms
  - Strict criteria reduce response rate



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Response Rates

- Methods to address and bolster rates:
  - Advance Letter
    - DNV GL will be sending out advance emails *and* letter mail
  - Interviewer Training
  - Survey Credentials
  - Call Attempts
  - Call Times

Estimated number of completes based on attempting a census and estimated response rates

Utility	Program	Free ridership		Spillover	
		n	RP	n	RP
Union	Comm and Small Ind	196	5%	169	5%
	Large Industrial	62	11%	48	17%
	Overall	258	6%	217	10%
Enbridge	Comm	350	5%	391	5%
	Industrial	82	10%	81	10%
	Run-It-Right				
	Overall	432	5%	472	5%

Free rider n ->690

Spillover n -> 689

Total n = 1,034

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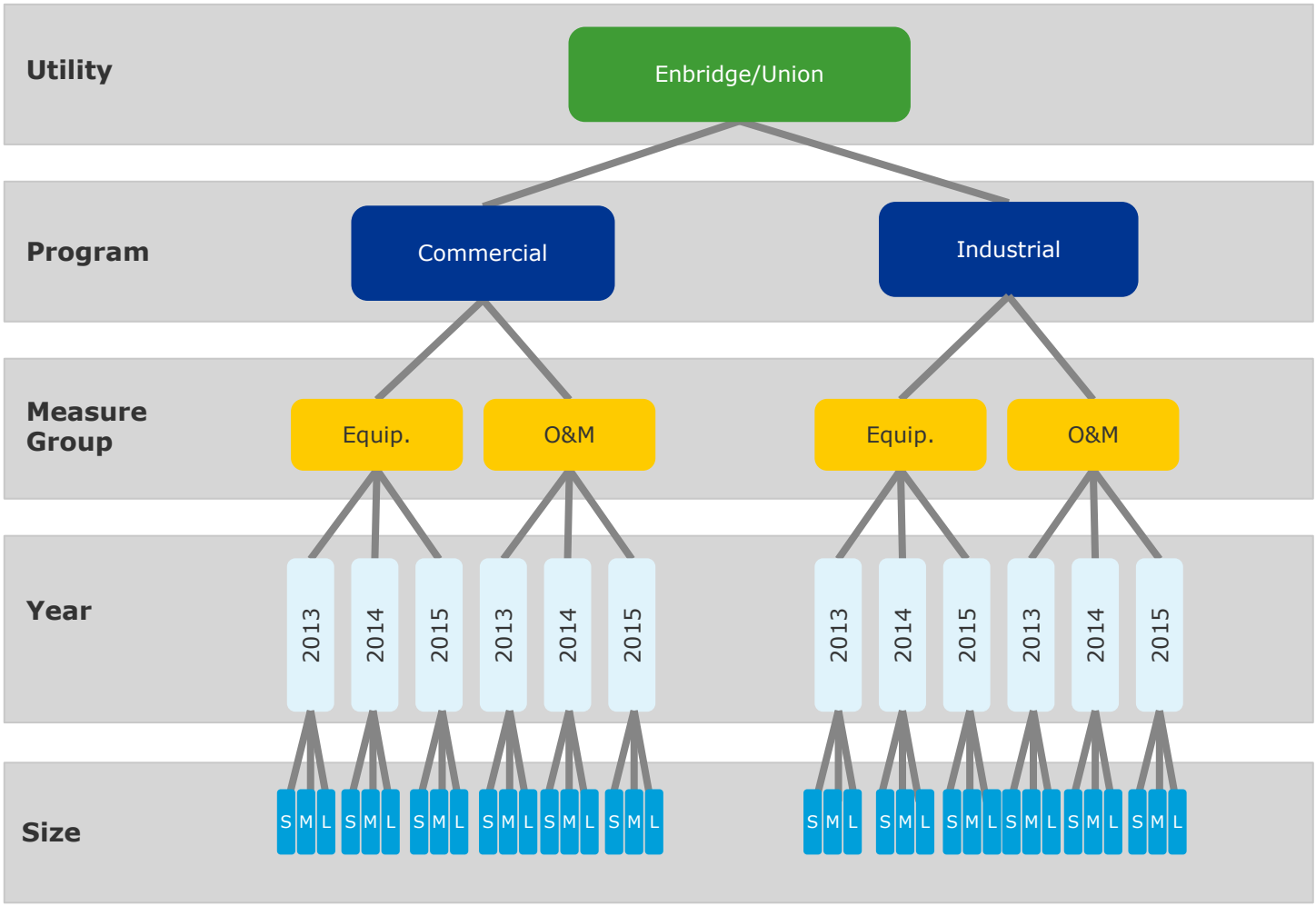
Rules for Selecting CATI vs. IDI

- All Direct Access program accounts
- Customers with more than two measures
- The largest customers up to a maximum IDI sample frame of 122 Union accounts and 90 Enbridge accounts.
  - 106 total IDIs assuming a 50 percent response rate.

TBD: Depending on project documentation we may push some complex projects into the IDI group in place of "the smallest of the large"

Generalized Stratification



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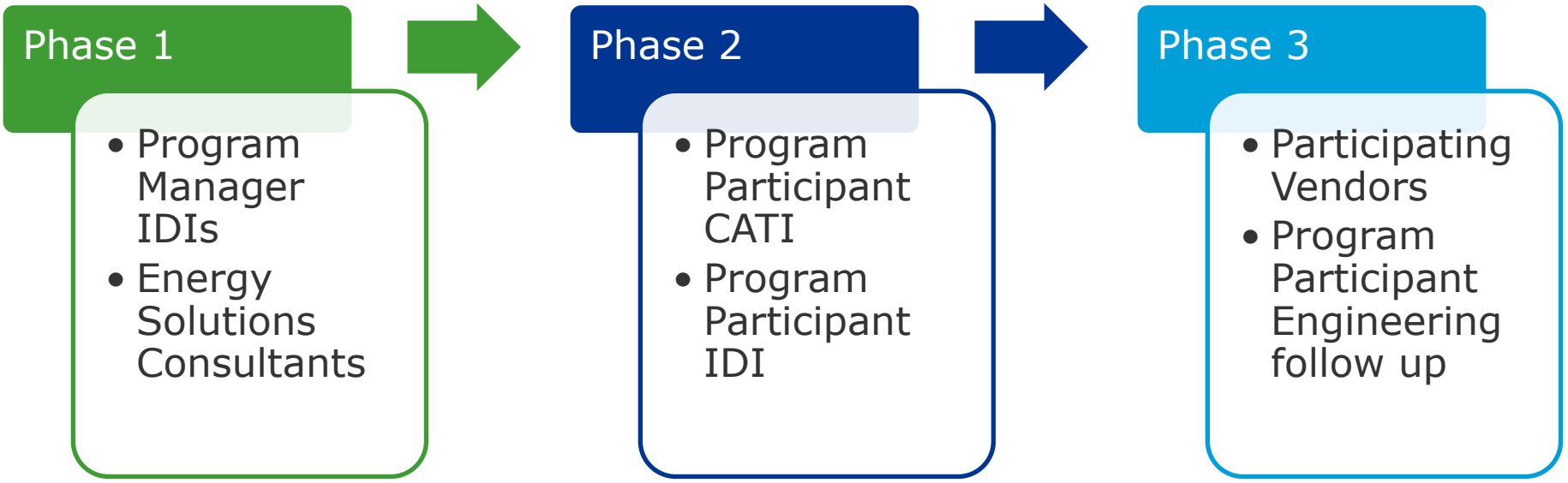
Task 3: Data Collection

Data Collection Staging

Net-to-Gross Modules	2013 Participants	2014 Participants	2015 Participants
Free Ridership	√* (too long ago)	√	√
Spillover	√	√	(too soon)

*used to inform the spillover analysis only, not for core free ridership

Respondents



Informed Respondents

- We define informed respondents as interviewees who were:
  1. Aware of the program at the time of the project; **and**
  2. Aware of Decision making, defined as
     a) Directly involved in the decision to choose equipment and go forward with the project **or**
     b) reasonably familiar with the project's decision-making process.
- If respondent fails criteria 1 or 2, we will ask for the contact information of a more informed respondent.
- We will not combine responses from multiple respondents to create a single completed survey (ie R1 knows about timing and R2 knows about efficiency)

If our initial field testing of the survey if our informed respondent criteria are rejecting too many respondents we will revisit the criteria and consult with the TEC to revise

Framing

- Focuses respondent on decision making process
- Aids in respondent recall
- Best to use open ended questions that allow respondent to talk
- IDIs allow for probes to aid recall of specific aspects
- Data collected can be reported on qualitatively
- Important not to bias later responses
- Focuses respondent on program interactions relating to the project in question.

Task 4: Data Analysis

Analysis

- Full Description will be provided in Methodology Memo Deliverable
- Free ridership method
- Spillover method
- Vendor attribution
- Ratio Estimation/Expansion

Free ridership evaluation

Simple Program Attribution (SPA)

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Exhibit B.Staff.5
Attachment E
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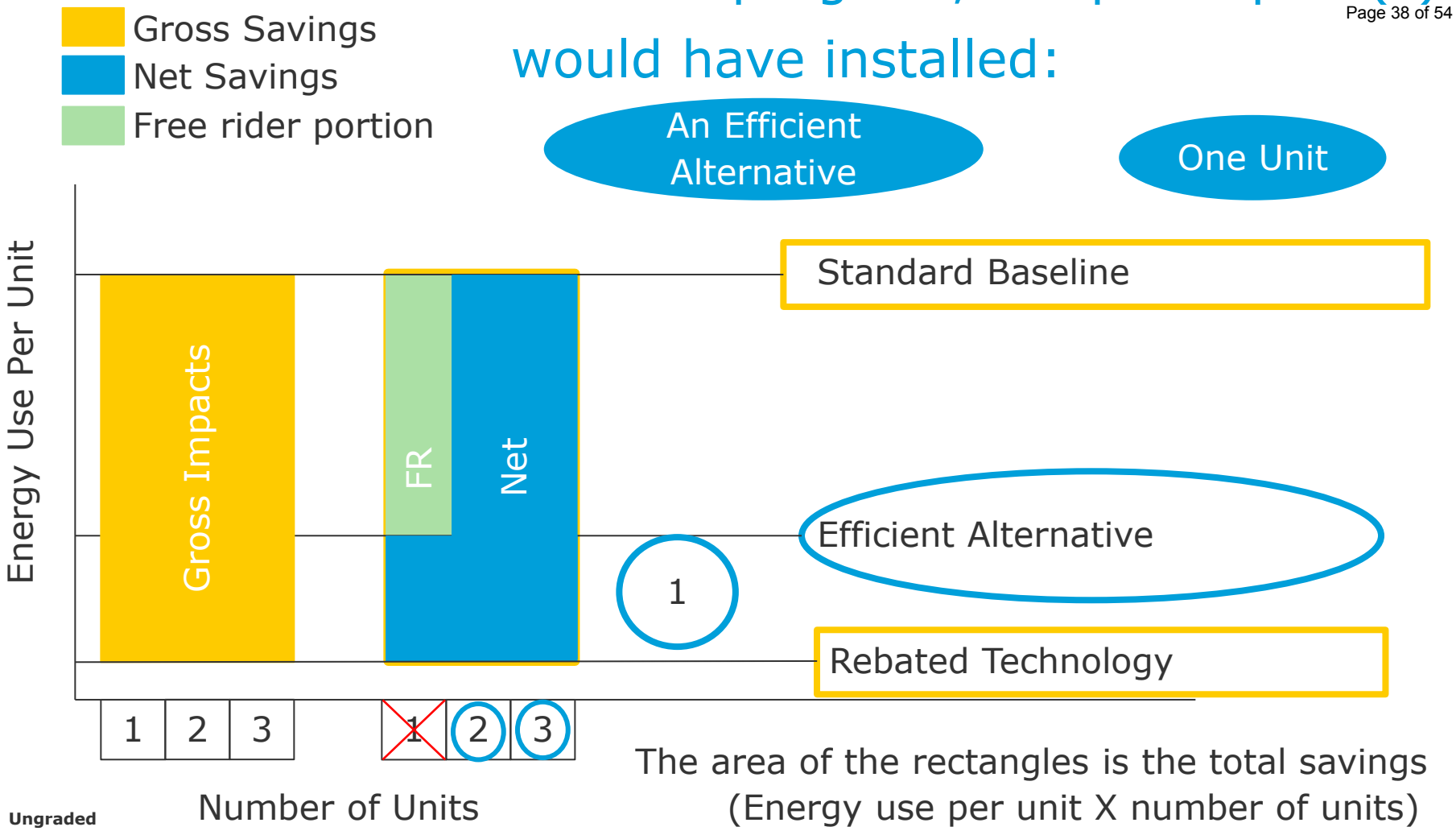
Without program, the participant(s) would have installed:



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Typical Treatment of Timing Credit or deferred free ridership (Example Accl period =4 years)

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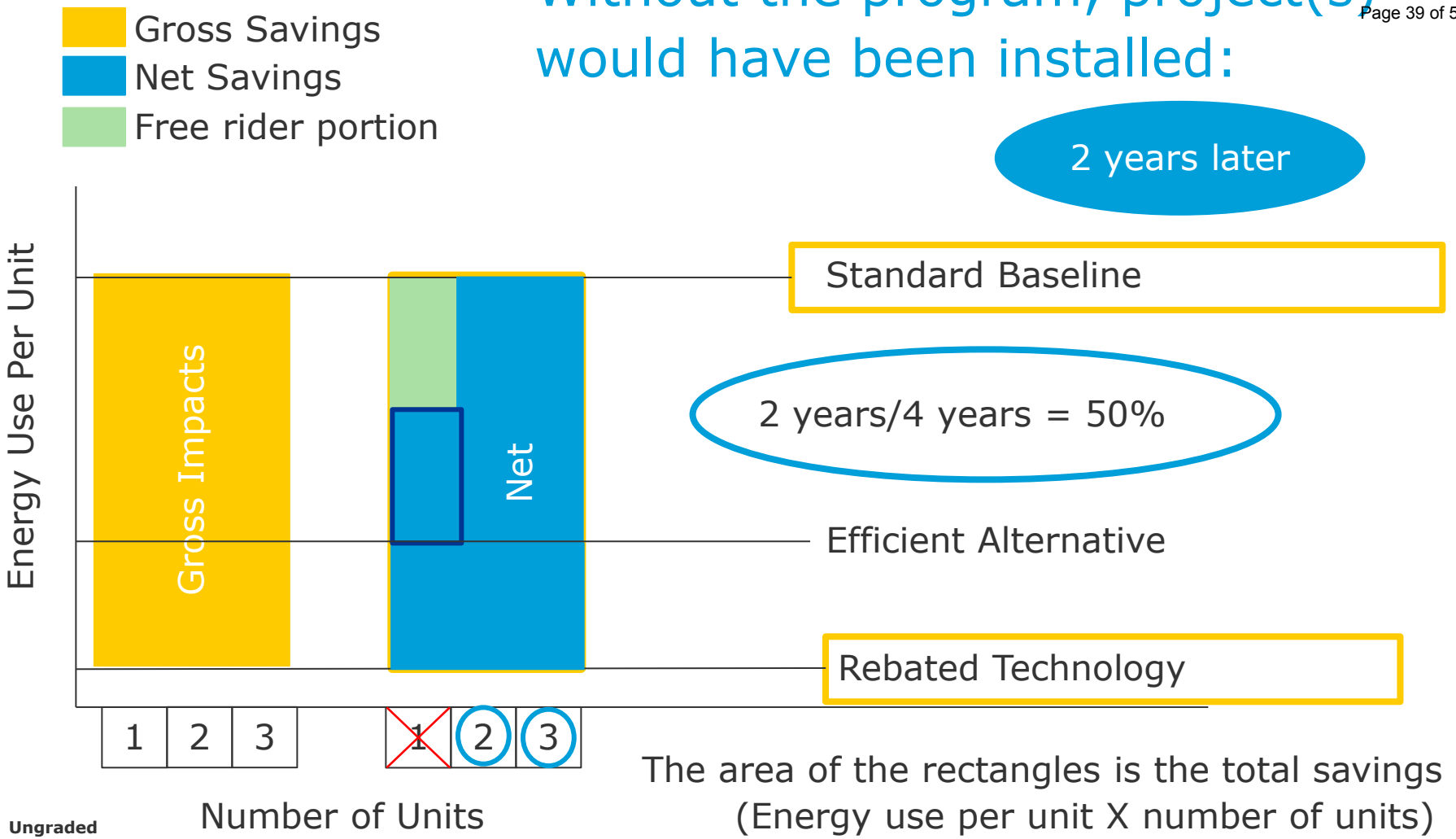
Without the program, project(s) would have been installed:



The area of the rectangles is the total savings (Energy use per unit X number of units)

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Efficiency for Custom Projects

Plan dependent upon accessibility of documentation

Engineer review of project documents:

1. Identify baseline used
2. Record baseline used for project in ref text for interviewer

Interviewer

1. On Efficiency, for projects where a less efficient option would have been done: use reference baseline identified by engineer to establish low end of efficiency range

O&M

- Primary Attribution is utility effect on the current project
- Secondary attribution will be a 10 point scalar question about all utility effects on the project including assistance for other projects.

- Limiting secondary attribution to
  - Measures with <100% primary Attribution
  - 2015 participation (free ridership only)

Vendor attribution

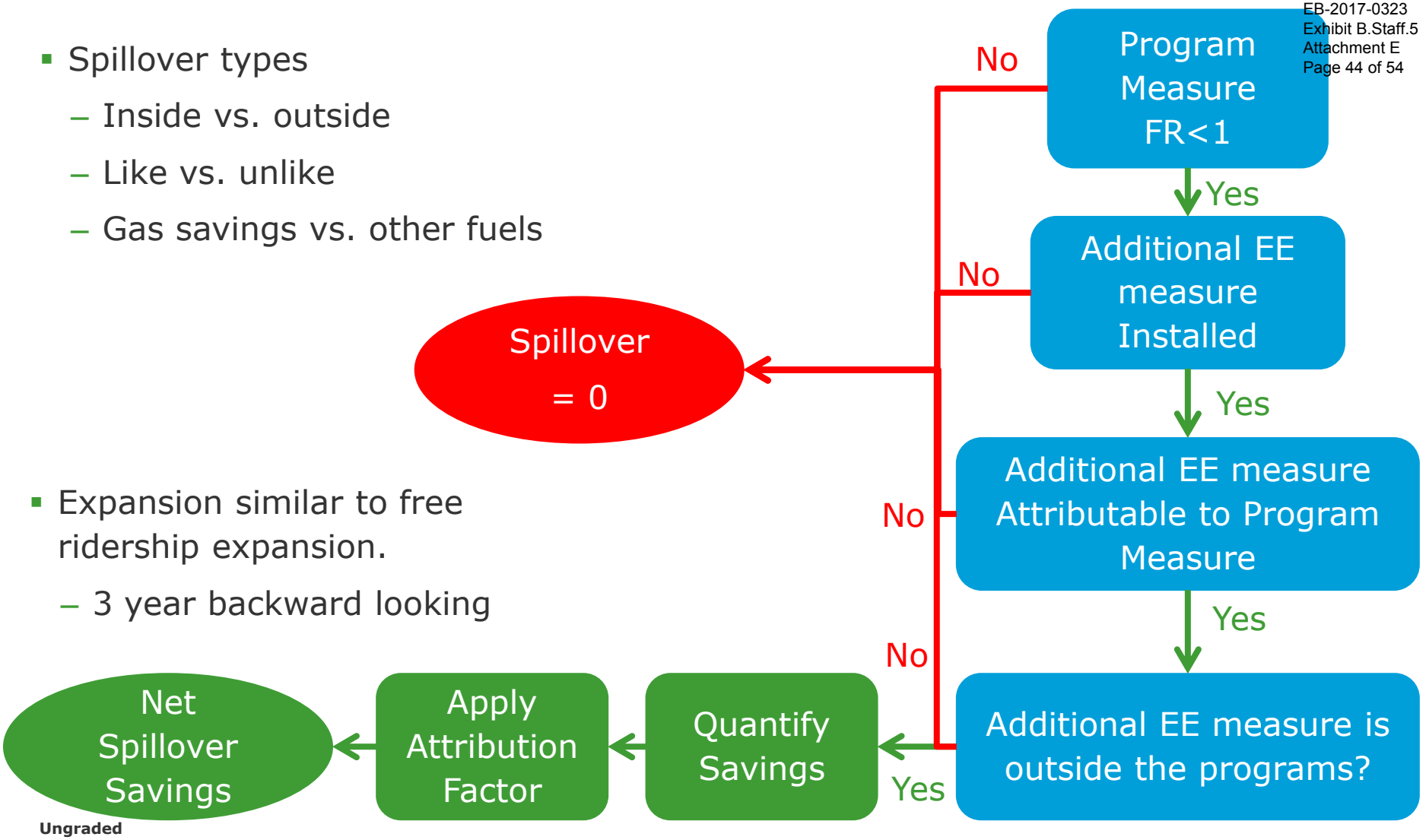
- Program influence on vendor recommendation for specific project
- Integrated with Participant survey by replacing the participant attribution score with the vendor score if the vendor score is higher.
- Budgeted for 80 projects.
- Options for selecting the projects:
  1. Participant must indicate vendor influence on project
  2. Select the 80 projects with the lowest attribution who meet criteria 1.
  3. Select the 80 projects with the greatest un-attributable participant savings
  4. Set a maximum attribution cap higher that allows more than 80 projects under it and select projects based on
     a) degree of vendor influence indicated by a scalar question in the participant survey
     b) Gross energy savings or un-attributable participant savings

Spillover evaluation

Participant Spillover Analysis

- Spillover types
  - Inside vs. outside
  - Like vs. unlike
  - Gas savings vs. other fuels

- Expansion similar to free ridership expansion.
  - 3 year backward looking



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Next Steps/Timeline

Next Steps

- Receive 2015 and Run-it-Right data
- Request Project Documentation
- Request Project Contact Information
- CATI firm contracting
- Draft Participant Data Collection Instruments
- Energy Solutions Consultants Phase I IDIs

Timeline

Tasks	2016											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Initial Staff Interviews	✓											
Kickoff Meeting			10									
Tracking Data Merge/Cleaning												
Draft Work Plan			2									
Work Plan Comments			17									
Final Work Plan			31									
Draft Survey and IDI Instruments			17									
Survey and IDI Instrument Comments			31									
Final Survey and IDI Instruments				14								
Review Project Documents												
Data Collection												
Data Analysis												
Methods Memo							29					
Draft Report									30			
Draft Comments												
Final Report & Presentation											16	

Schedule Risks

Schedule Risks	Explanation	Contingency
Data Reception	Timing Controlled by Union/Enbridge. Currently have no data for Run-it-Right and no data for 2015 program year. Anticipate data in March, but unsure of exact timing.	1) Move forward with work plan without missing data. Use 2014 data to proxy 2015.
Data Processing	Categorizing and Aggregating data in a way that is meaningful to eventual respondent and in the context of the NTG analysis. Initial data has some conflicting and unclear information.	1) Use best judgment with initial data for work plan. 2) Maintain list of "judgment calls" to clarify 2) confirm and clarify based on project documentation when it arrives 3) request clarifications where project documentation does not resolve questions.
Documentation Reception	Timing Controlled by Union/Enbridge	1) Send formal documentation request with explicit, agreed upon deadline for documents needed.
Documentation Reviews	Projects may have considerable documentation, some of which does not have bearing on the NTG effort.	1) Establish clear guidelines for information to be reviewed 2) provide full context of evaluation, goals and information needed from project documentation to satisfy project objectives 3) Utilize engineers familiar with a) custom gas projects and b) NTG methods and interviews

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Schedule Risks

Schedule Risks	Explanation	Contingency
Contact information Reception	Timing Controlled by Union/Enbridge	1) send worksheet for contact information request 2) include clear directions for worksheet completion, including context of what we are attempting to learn from the interviews. 3) ensure the worksheet is simple and easy to complete.
Contact information processing	Contact information may be incomplete or come in hard to use format	1) Clear directions for the request 2) use experienced analyst to prepare data for survey
Resourcing	Having the right resources available at the right time is a challenge with projects that have experienced delays	1) reserve necessary resources for project in DNV GL's internal systems. 2) keep project on schedule to avoid conflicts with other project needs. 3) keep project sponsor aware of needs and championing project
Survey House Availability	Availability at the right time is a challenge with projects that have experienced delays	1) start conversation with Nielson now. 2) identify potential backups (Malatest) in case Nielson is unable to work on project due to long delay.
Review Periods	Dependent upon OEB/EAC/TEC priorities	1) establish clear and explicit deadlines for reviews
Decision Making	Dependent upon OEB/EAC/TEC priorities	1) schedule meetings with clear agendas that have key decisions up front.
Response Rates	Response rates on surveys have been declining, which can extend the time required for data collection	1) attempt a census so that call order does not matter, provided number of sample units makes this manageable and within original scope size. 2) IDI rather than CATI for the most complex and large projects 3) email participants prior to call to ask for cooperation 4) send advance letter to participants prior to call to ask for cooperation

Financial Risks

Financial Risks	Explanation	Contingency
Currency Exchange Rates	USD/CAD rates have been highly variable	Fix prices in USD.
IDI Sample Size	Attempting a census with best practice approaches (minimum number of calls for all sites, and all efforts made to increase response rates) and an assumed 50 percent response rate could mean more completed IDIs than we have budgeted for.	1) Clear concise instruments to reduce time on phone 2) Simple data entry forms to reduce time entering data 3) Use admin staff to enter data for engineers who use paper form on phone (engineer review digital data after entry) 4) Advance letters and emails to decrease number of attempts per complete 5) limited number of dedicated engineers to reduce training costs and increase efficiency on attempted calls
Survey House re-negotiation	Project delays may prompt survey house to request re-negotiation	1) exchange rate may allow increase in survey costs if survey house paid in CAD. 2) open negotiations with alternative provider 3) census may provide survey house with cost efficiencies
Resourcing	Planned resources have been promoted since project scoped and now cost more. Planned resources have left company	1) substitute with acceptable alternatives. Inform TEC of new staff qualifications.
Travel	Additional kickoff meeting was not in original scope	1) cost may be absorbed by having OEB as decision make rather than consensus based TEC.
Timeline	Longer timeline tends to use project funds more than shorter timeline	1) seek to reduce schedule delays 2) Ensure efficiency or delay non-critical work when critical path is delayed to avoid additional expense

Quality Risks

Quality Risks	Explanation	Contingency
Response Rates	Response rates on surveys have been declining, which can reduce sample sizes, introduce uncertainty about bias and make it hard to get data from large customers who have a large effect on final result	1) attempt a census so that call order does not matter 2) IDI rather than CATI for the most complex and large projects 3) email participants prior to call to ask for cooperation 4) send advance letter to participants prior to call to ask for cooperation
Informed Respondents	Multiple people in a business are often involved in the decision to purchase capital equipment or spend money on optimizing or maintaining existing equipment. For consistency and cost reasons a single respondent from a company is preferable to interviewing multiple people at a business about the decision. Ensuring we have a respondent who knows enough about the decision to complete the project and the influence of the program on that decision is the crucial challenge of the data collection effort	1) Clear guidelines and screening questions to determine an informed respondent 2) removal from study of un-informed respondents 3) single interview for a project may require contacting multiple people at the site to determine an informed respondent.
Engineering Estimates	Spillover estimates will be based on engineer estimates of savings for projects that were not part of a program. We expect that these projects will not have the typical amount of documentation that we see for program rebated projects. The engineering estimates will be based on respondent provided information, and in some cases may not include specific sizes or operating characteristics.	1) Engineers will be required to thoroughly document information collected from the respondents and from third party sources. Justification for savings estimates will be provided, along with values and sources of key assumptions and calculation methods. 2) A senior engineer (Tammy) will review all estimates. 3) transparently provide documentation of project savings (within confidentiality limits) in appendix of report
Analyst Experience	Since the project start, turnover in our analyst group has meant a resourcing change for this project. The planned analyst has less experience, but has proven herself capable on similar projects	1) direct oversight of analyst by PM who has performed the same work previously 2) Any further substitution will be with an analyst PM has personal experience of success working with in the past.

Questions?

www.dnvgl.com

SAFER, SMARTER, GREENER

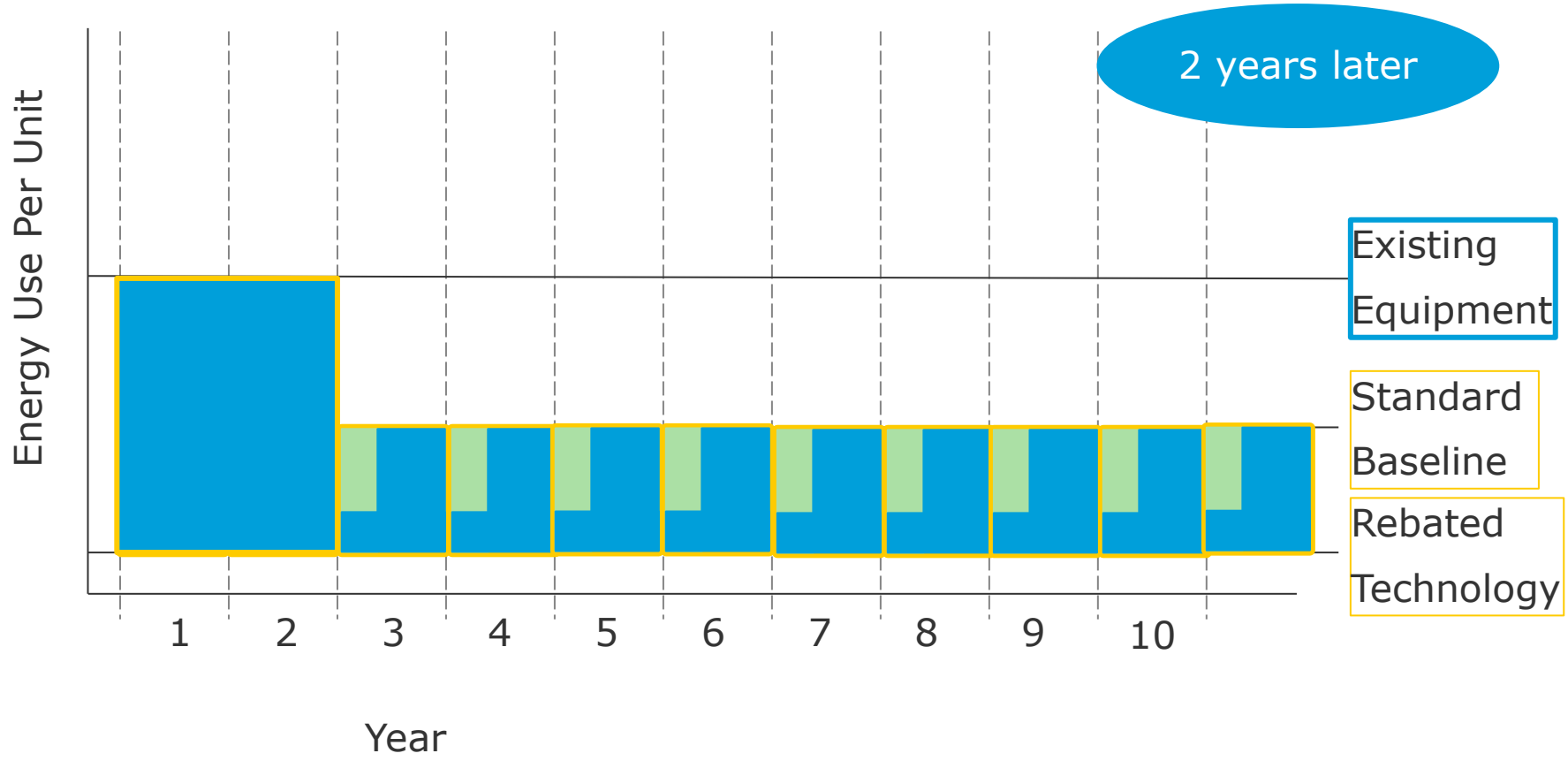
Ungraded

Pocket

Lifecycle Net Savings Treatment of Timing Credit (Example)

Gross Savings
Net Savings
Free rider portion

Without the program, project(s) would have been installed:



Ungraded

Ontario Natural Gas Technical Evaluation Committee (TEC)

Request for Proposal

Measurement of Net-to-Gross (NTG) Factors for Ontario's Natural Gas Custom Commercial and Industrial Demand Side Management (DSM) Programs

RFP-002-2013 (2)

Date of Issue:
November 1, 2013

Proposal Due Date:
December 23, 2013

Table of Contents

Section 1 – Background Information

1.1 Ontario's Natural Gas Demand Side Management and Technical Evaluation Committee Background

Enbridge Gas Distribution (Enbridge) and Union Gas Limited (Union) (together, "utilities") have been delivering Demand Side Management (DSM) initiatives since 1995 and 1997 respectively. These initiatives include program activities across all customer segments including residential, low income, commercial, and industrial. Combined, both utilities serve the vast majority of small and large volume natural gas customers across Ontario[1].

On June 30th 2011, the Ontario Energy Board (the Board) issued new DSM Guidelines for Natural Gas Utilities which takes into account the experience gained by the two utilities along with current market conditions. The operating objectives for this new framework include the maximization of cost effective savings, prevention of lost opportunities and the pursuit of deep savings. To encourage the natural gas utilities to aggressively pursue DSM savings, the Guidelines also outline a DSM financial incentive based on performance. This incentive uses a series of scorecard metrics which are largely weighted on cumulative (lifetime) natural gas savings (m^3).

In keeping with the new Guidelines, Enbridge and Union developed a three year portfolio (2012 to 2014) of programs[2] based on three generic program types: resource acquisition, market transformation, and low income.

A summary of the approved 2012 budget and target natural gas savings put forward by Enbridge and Union are highlighted in the tables below.

Table 1.1 Enbridge Gas Distribution Board Approved 2012 DSM m3 Targets and Budgets

Enbridge Gas Distribution[3]		
Program Type	**2012 Lifetime Savings (m^3)**	**2012 Program Budget[4]**
Resource Acquisition	820,453,481	$15,125,000
Low Income	62,463,070	$6,120,650
Market Transformation	n/a[5]	$3,920,000
Total	**882,916,551**	**$25,165,650**

[1] http://www.ontarioenergyboard.ca/OEB/_Documents/RRR/2011_naturalgas_yearbook.pdf
[2] See section 2.3 – Sources of information.
[3] http://www.ontarioenergyboard.ca/OEB/_Documents/Documents/EGDI_appl_DSM%20plan%202012-2014_20111104.PDF
[4] Overheads not included.
[5] Performance metrics for Market Transformation programs are not based on savings but on other indicators or market change

Table 1.2 Union Gas Board Approved 2012 DSM m3 Targets and Budgets

Union Gas Limited[6]		
Program Type	**2012 Lifetime Savings (m^3)**	**2012 Program Budget[7]**
Resource Acquisition	826,000,000	$14,022,000
Large Industrial[8]	1,000,000,000	$4,534,000
Low Income	43,000,000	$6,839,000
Market Transformation	n/a[9]	$829,000
Total	**1,869,000,000**	**$26,223,000**

Resource acquisition programs which contribute to the majority of the proposed savings are designed to achieve direct measureable savings and include both prescriptive and custom based programs. Custom programs targeting commercial and industrial customers, particularly larger customers, represent more than half of the portfolio savings for both Enbridge and Union.

The Board has identified free ridership and spillover as the two adjustment factors which may be taken into consideration when considering the net lifetime natural gas savings attributable to programming efforts.[10] The natural gas utilities are required to consider free ridership for all their applicable programs. They are also free to propose inclusion of spillover where it can be supported by comprehensive and convincing empirical data.

The following tables summarize the 2012 results of Enbridge[11] and Union's Commercial and Industrial custom based Resource Acquisition programs.[12] The adjustment factors used to generate the net lifetime savings shown in the tables below, are based on the free ridership findings from the 2008 Custom Attribution Study[13] and do not account for spillover.

[6] http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/322654/view/UNION_SettlementP_20120131.PDF
[7] Overhead and Inflation factors not included.
[8] For Union Gas, Large Industrial is another permutation of a Resource Acquisition program with its own shareholder performance scorecard.
[9] Supra see note 6
[10] Page 22, Ontario Energy Board, Demand Side Management Guidelines for Natural Gas Utilities EB-2008-0346, June 30 2011.
[11] Subject to clearance of accounts application with the Ontario Energy Board.
[12] These are the audited results, but they have not yet been approved by the Ontario Energy Board.
[13] See Appendix B

Table 1.3 Enbridge Gas Distribution 2012 Claimed m^3 Savings for Commercial and Industrial Custom Programs

Enbridge Gas Distribution			
Sector	**Gross Lifetime Savings (m^3)**	**Net Lifetime Savings (m^3)**	**Number of Projects**
Commercial	286,039,013	251,714,332	490
Large New Construction	181,676,611	134,925,548	70
Multi-Residential	275,160,544	220,128,435	275
Industrial	610,001,350	305,915,406	91
Total	**1,352,877,698**	**912,683,721**	**926**

Table 1.4 Union Gas 2012 Claimed m^3 Savings for Commercial and Industrial Custom Programs[15]

Union Gas			
Sector	**Gross Lifetime Savings (m^3)**	**Net Lifetime Savings (m^3)**	**Number of Projects**
Commercial Existing	160,929,048	74,161,791	160
Commercial New Construction	40,381,144	18,575,326	8
Industrial Agriculture	250,881,301	115,405,399	78
Industrial Non-Agriculture	1,000,892,847	460,410,710	229
Large Volume Industrial	3,165,754,522	1,456,247,081	180
Total	**4,618,838,862**	**2,124,800,307**	**655**

Additional 2012 program details can be found in Appendix D and E.

In addition to developing multi-year plans, the natural gas utilities were required to establish a joint Terms of Reference (ToR) for a stakeholder engagement process. This ToR outlines the process by which the natural gas utilities will engage with their stakeholders with respect to program review, evaluation, audit and all other aspects in which the stakeholders are involved. The ToR also established a Technical Evaluation Committee (TEC). The goal of the process is "to establish DSM technical and evaluations standards for measuring the impact of natural gas DSM programs in Ontario."

This RFP is being issued by the TEC. Though the utility members of the TEC will manage administrative aspects of the project, the TEC as a whole (by consensus) will select the winning bid and manage the content of the work. The TEC is comprised of the following members:

- Jay Shepherd representing School Energy Coalition
- Julie Girvan representing Consumers Council of Canada
- Chris Neme representing Green Energy Coalition
- Bob Wirtshafter, Ph.D., Independent Member

[14] Low-Income not included in this table because it is not within the scope of this NTG study
[15] Low-Income not included in this table because it is not within the scope of this NTG study

- Ted Kesik, Ph.D., Independent Member
- Enbridge Gas Distribution Inc.
- Union Gas Ltd.

1.2 Enbridge and Union Custom Commercial and Industrial Programs

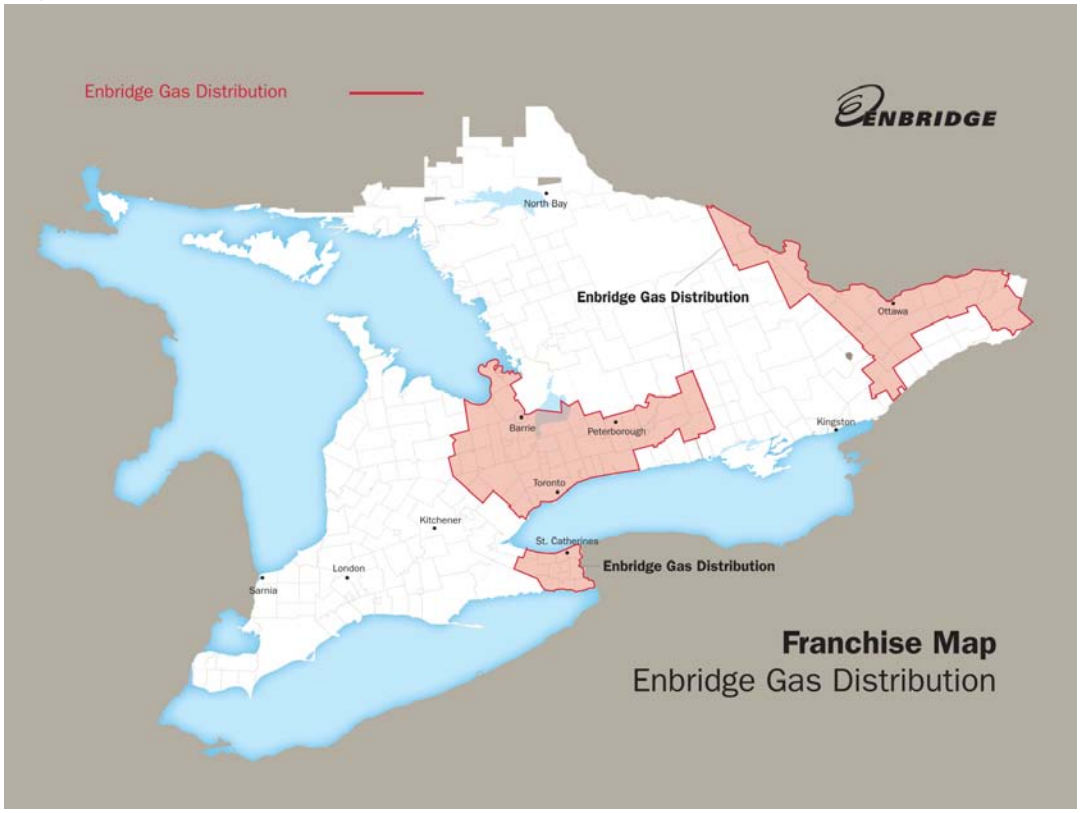
When considering the design for this study, the unique franchise territories, market segments and program designs for both Enbridge and Union should be taken into account.

Enbridge Gas Distribution:

Enbridge Gas Distribution serves approximately 1.6 million customers within its franchise area. Enbridge's 2012 – 2014 DSM Plan is the result of several years of work, with input from staff and external stakeholders. The plan reflects a new strategy and direction for the Company's DSM programs, an approach designed to respond to customer needs and changing market conditions. During August and September of 2011, Enbridge's extensive consultation with Intervenors resulted in acceptance of new program components, an expanded budget and Free Ridership value[16] for Low-Income programs. For this reason, Low Income custom projects will not be included for the purpose of this study. Agreement was also reached on budget allocation, metrics, and targets for the 2012 program year.

Under the 2012-2014 DSM Plan, the Total Resource Test (TRC) is used primarily as a program-screening tool while program evaluation focuses on gas savings by Cumulative Cubic Meters (CCM), participants, and cost-effectiveness ($/CCM). The Guidelines also establish budget limits and provide for new utility performance incentives for DSM activities.

The resulting Enbridge 2012 – 2014 DSM Plan (EB-2011-0295) was approved by the Board on February 9th, 2012.



[16] As a result of its negotiated Free Ridership value, Low Income will not be included in the study.

Union Gas Limited:

Union Gas' distribution business serves about 1.4 million residential, commercial and industrial customers in more than 400 communities across northern, southwestern and eastern Ontario. Its distribution service area extends throughout northern Ontario from the Manitoba border to the North Bay/Muskoka area, through southwestern Ontario from Windsor to just west of Toronto, and across eastern Ontario from Port Hope to Cornwall.

In 2011, Union sought approval for a proposed 2012 – 2014 portfolio of DSM programs which included custom based programs targeting commercial and industrial customers. Following a series of stakeholder discussions, Union received approval for its DSM plan with the caveat that the Large Volume Industrial program be filed as a separate application for 2013 and 2014.

In March 2013, Union Gas received Board approval for a 2013 – 2014 Large Volume DSM Plan that gives customers direct access to the full customer incentive budget they pay in rates as opposed to an aggregate pool of funds. Customers must use their funds to identify and implement energy efficiency projects by August 1st or lose the funds to be used by other customers in their rate class. This new Self Direct Program will now give large volume customers increased flexibility in accessing larger incentive amounts for larger projects. A more detailed description of the Union's Commercial and Industrial Custom Programs can be found in Appendix A.

1.3 Previous Net-to-Gross Research

During the fall and winter of 2008, while operating under an earlier DSM framework, Enbridge and Union commissioned a study to evaluate free ridership and spillover effects of their custom projects programs[17]. The study was designed to produce results at a 90% confidence level with +/- 10% precision at the utility level and a 90% confidence level with +/- 20% precision at the following segment levels:

[17] See Appendix B.

- Industrial
- Agriculture
- New Construction
- Commercial
- Multi-Residential

Following the study and based on its findings, the Board approved the resulting free ridership values; however spillover rates were not filed. With the establishment of the TEC, a review of these program effects is considered a priority.
Earlier this year through an RFP process, the TEC commissioned a North American jurisdictional review[18] which examined current trends in net-to gross factors for energy efficiency programs. The study was designed to provide the TEC with data to support them in determining appropriate next steps for updating the 2008 free ridership rates.

Based on the finding from the jurisdictional review and TEC discussions, the TEC has commissioned a full net to gross study as described in this RFP document.

[18] See Appendix C

1.4 Sources of Information

The following is a list of information which may assist the proponent in preparing a response to this RFP:

Title	Link/Location
Union Gas website	http://www.uniongas.com
Enbridge Gas Distribution website	https://www.enbridgegas.com
Summary of Enbridge and Union Gas Commercial and Industrial Natural Gas Custom Programs	Appendix A
Union Gas 2012 – 2014 DSM Plan	http://www.ontarioenergyboard.ca/OEB/_Documents/Documents/UNION_APPL_2012%20to%202014%20DSM%20Plan_20110923.pdf
Union Gas 2013 – 2014 Large Volume DSM Plan	http://www.ontarioenergyboard.ca/OEB/_Documents/Documents/UNION_APPL_DSM_LargeVolume_2013-14_20120831.pdf
Enbridge Gas Distribution 2012 – 2014 DSM Plan	http://www.ontarioenergyboard.ca/OEB/_Documents/Documents/EGDI_appl_DSM%20plan%202012-2014_20111104.PDF
Ontario Energy Board, Demand Side Management Guidelines for Natural Gas Utilities EB-2008-0346	http://www.ontarioenergyboard.ca/OEB/Industry/Regulatory%20Proceedings/Policy%20Initiatives%20and%20Consultations/DSM%20Guidelines%20for%20Gas%20Distributors
Enbridge Gas Distribution 2012 Commercial and Industrial Custom Projects	Appendix D
Union Gas 2012 Commercial and Industrial Custom Projects	Appendix E

Section 2 – Study Objectives, Work Scope and Deliverables

2.1 Study Goals and Objectives

As part of its mandate, the TEC prioritizes and oversees evaluation activities for Ontario's Natural Gas DSM programs. Following the review of other North American jurisdictions[19] the TEC concluded that a full NTG study was necessary. As such, the purpose of this Custom Program Free Ridership and Participant Spillover Study is to develop reliable NTG estimates that are applicable to Enbridge and Union Gas' commercial and industrial custom energy conservation programs. Descriptions of these programs can be found in Appendix A.

The primary objective for this study is to assist the TEC in developing NTG factors to be applied to each utility's custom commercial and industrial programs.[20] This includes:

- Estimating program free ridership factors by market sectors and precision targets for both the Enbridge and Union Gas' custom Commercial and Industrial programs. A 90/10 precision target is preferred for both the aggregate and sub segment level.

- Estimating participant inside and outside[21] spillover as per market sectors and precision target for both the Enbridge and Union Gas' custom Commercial and Industrial programs.[22]

- Provide guidance on the development of a strategy for applying free ridership and spillover data collected on previous program participation to forward looking DSM program activity.

Note: It is not intended that the study will include data collection of non-participant spillover.

The following section of this RFP describes requirements of the study on the assumption that the primary methodology will be surveying participants. The TEC understands that this is a common method used in North America to estimate NTG effects. The TEC is actively interested in proposals that rely on other methodologies, either in place of or in support of the participant survey approach, including non-participant surveys, econometric analyses, and other methods. Proponents that are able to provide higher acceptability of results through use of additional or alternative methods will be favourably considered. Any additional costs associated with an additional or alternative approach should be shown separately.

For the purposes of responding to this RFP, the TEC will rely on the bidder to provide recommended segmentations for both Enbridge and Union's commercial and industrial market sectors. At a minimum, the TEC would expect the bidder to provide a brief narrative explanation on viability of achieving a 90/10 precision target within the prescribed budget for the market segments targeted by the study. One required segment that must be looked at separately is Union's Large Volume Industrial customers due to the unique nature of that program. Proponents are encouraged to define additional segmentation as appropriate for approval by the TEC.

Table 2.1 Proposed Customer Segments

[19] See Appendix C.
[20] Supra note 11.
[21] Inside spillover refers to non-incented measures that were installed within the same project or facility. Participant outside spillover refers to measures for which the customer did not receive an incentive adopted in an outside location or unrelated project for a participating customer.
[22] Trade ally surveys should be considered and may be informative for evaluating non participant spillover program effects.

The TEC reserves the right to provide comments and requested revisions to the successful proponent after the bidding process.

2.2 Study Scope and Anticipated Tasks

The TEC seeks a qualified proponent or a team of proponents to perform the following expected tasks:

Project Kick-Off Meeting – The proponent will participate in a kick-off meeting with the TEC. The purpose of this meeting will be to introduce the proponent to the TEC members, review the proponent's proposed approach, work plan, timelines, and discuss any changes or questions. The proponent will be responsible for scheduling meetings, developing meeting agendas, running the meeting and drafting revised documents.

The proponent is expected to provide the TEC with study updates on a bi-monthly basis. The proponent will be responsible for scheduling and running the bi-monthly meetings. Meetings should align with scheduled TEC monthly meetings (to be scheduled).

Develop Survey and Sampling Plan – The proponent will develop a sampling plan which should include a proposed schedule for any interviews and the appropriate sample size that will achieve the prescribed precision targets. The proponent should consider accuracy for both free-ridership and participant spillover in the sample design and whether different years of participation be sampled for each (e.g. sample 2011 customers for participant spillover and 2012/13 customers for free-ridership).

There is an expectation that the proponent will enable the TEC to participate in a pre-test of any survey.

Data Collection– Developed in conjunction with the above mentioned, the proponent will develop a survey methodology, survey plan, research instruments, and calculation algorithms to meet the study objectives described in section 2.1.

Utilizing the above sampling and survey plans, the proponent will conduct interviews. An advance letter explaining the study will be facilitated by the Utilities prior to the survey. Research methods are not limited to telephone interviews and may include on-site in-depth interviews with more complicated processes. For the purpose of this proposal, proponents are expected to tell us how many on-site interviews they would envision and the associated costs for each.

Any customer inquiry or request for information outside of the study objectives should be forwarded to the Utilities as soon as possible so that they can respond to their customers' issues in a timely manner.

Data Analysis – After the data collection activities and preliminary analysis are concluded, the proponent will prepare a draft memorandum that discusses the proposed free ridership and participant spillover calculation algorithms. The final scoring methodology approved by the TEC, will become part of the final report.

Draft/Final Report - The proponent shall prepare a draft report for review and comment by the TEC. Considering draft report comments and feedback provided by the TEC, the proponent will produce a final report that may be published by the TEC.

2.3 Deliverables

The project deliverables should include the following:

- A detailed work plan and schedule guided and approved by the TEC.
- For any survey methodology that is proposed:
    - A draft and final sampling plan and scoring methodology approved by the TEC. As noted in the study objectives, a 90/10 precision target is preferred at both the aggregate and sub segment levels. If this is not possible within the suggested budget, please outline the additional budget required to achieve this target.
    - A draft and final of survey instrument and guides approved by the TEC and experienced utility staff.
    - A draft and final data tracking mechanism to ensure responses are collected in a systematic and consistent manner across different interviewers.
    - A draft and final calculation algorithms memo outlining the methodology used to translate survey scores into free ridership and participant spillover results as approved by the TEC.
- For any non-survey methodology that is proposed, such other plans and reports as would be consistent with that methodology. In addition, the proponent would be expected to explain how that methodology meets with desired precision levels.
- A draft report addressing the study objectives described in Section 2.1 Study Goals and Objectives.
- A final report incorporating comments from the TEC.

2.4 Proposal Requirements

The proposal should include the following:

- A detailed description of the recommended approach and methodology that will be used to achieve the study objectives, and, for any survey methodology that is proposed, to achieve the expected tasks described in Section 2.2 Study Scope and Anticipated Tasks. The proposed methodology must specifically address the 2013 change in the Union Large Industrial program described in this RFP, and how the proponent proposes to deal with that change in the context of the overall study objectives.
- An outline of the experience, skills and qualifications for all project team members.
- A list of three references including contact information for other projects. Examples of similar work would be helpful.
- An outline of a proposed schedule for delivery of the work, delegation of responsibility and work plan.
- An outline of fees and costs, including hours and rates by tasks and team member.
- **Subcontractors:**
  (a) Identification of any subcontractors, including any affiliates of the Proponent, to be used in performing the Services. Subcontractors cannot be changed without written approval of the TEC. Where no list of subcontractors is submitted, the Proponent will only use its own forces to perform the services.
  (b) Subcontractors' company name, address, contact name, relationship to the Proponent, and work to be contracted to subcontractor must be provided to the TEC as part of the Proposal.
- Insurance: Information demonstrating the proponent possesses adequate insurance, given project risks and requirements.

- Workplace Safety and Insurance Board (WSIB): Information demonstrating registration with the WSIB, as well as all compliance with its requirements as applicable.

2.5 Selection Criteria

Proposals will be evaluated based on the following criteria:

- Approach, work plan and methodology proposed:
    - Does the approach/methodology present a comprehensive, sound approach for accomplishing the requirements of this RFP?
    - Does the proposed approach demonstrate a clear understanding of the unique market segments and direct and indirect market approaches by Enbridge and Union Gas?
    - Does the proposed methodology adequately measure impact on customer behavior beyond financial incentives or similar transactions?
    - Does the approach/methodology reflect best practices associated with measuring net-to-gross factors?

- Qualification and experience of key project personnel particularly with their experience in NTG analysis and C&I custom programs:
    - Does the proposed team have experience in conducting similar work?
    - Demonstration that the firm has worked with a collaborative multi-stakeholder processes. Does the project team demonstrate a sufficient understanding of the Ontario marketplace, regulatory processes and DSM framework?
    - Is the project team's overall capability appropriate?
- Proposal costs:
    - How cost-effective is the proposal?
    - Is the proponent's cost allocation by task and personnel appropriate when compared to the cost allocation of other comparable proposals and their projected results?
    - Are hourly rates, overhead rates, and total hours reasonable and appropriate for completing each task?

2.6 Queries and Clarifications

- All inquiries or requests for clarification should be submitted electronically by email to the designated contact person. They will be shared with all members of the TEC.
- Only a response to a query that has been incorporated into or issued as an addendum will modify or amend this RFP and, otherwise, responses to queries will have no force or effect whatsoever and shall not be relied upon by any proponent.
- At the discretion of the TEC, responses to one proponent may be provided to all proponents.

2.7 Exclusion and Waiver of Liability

Neither the TEC nor any of its members nor the organizations with which they are associated (collectively referred to as "the TEC group" will have any liability to any person or entity for any damages, including, without limitation, direct, indirect, special or punitive damages, arising out of or otherwise relating to this RFP, including without limitation, (i) any proponent's proposal; or (ii) any compliant or non-compliant, qualified or unqualified submission or participation or involvement in this RFP process; or (iii) acts, omissions or any course of conduct by any members of the TEC group, the primary contact or any agent or representative of the TEC in connection with the conduct of this RFP process.

The waver and exclusion applies to all possible claims, whether arising in contract, tort, equity or otherwise, including, without limitation, any claim for a breach by any of the TEC group of a duty of fairness or relating to the failure by any of the TEC group to comply with the rules set forth in this RFP. Each proponent has read, understood and agree that this waiver and exclusion of liability is clear and unambiguous and by making its submission it agrees that it has no claim in any way connected to any of the circumstances described in this section or the RFP. The provisions of this section shall survive any cancellation of this RFP and the conclusion of this RFP process.

2.8 Reservation of Rights

The TEC has the right, at their discretion, to change the dates, schedule, deadlines, process and requirements described in this RFP, to accept any Proposal, to reject any or all Proposals, to disqualify any Proponent, to change the RFP process or any of the RFP Documents, to change the limits and scope of the Services, to not accept the lowest price Proposal, to reissue the same RFP or a different request for proposals document in relation to the Services, to seek clarification around any Proposal to waive immaterial defects and minor irregularities in a Proposal, to receive any Proposal after the Proposal Submission Deadline, to cancel this RFP or the Services or to elect not to proceed with the Services for any reason whatsoever, at any time, without incurring any liability or obligation for costs and damages incurred by any Proponent.

The TEC may independently verify any information in any Proposal. The TEC also has the right to disqualify any Proponent and reject the Proposal of any Proponent which has failed to disclose any information that would, if disclosed, materially adversely affect the TEC's evaluation of the relevant Proponent's Proposal.

The TEC may, in its discretion, without liability, cost, or penalty, at any time, reject any Proposal or disqualify a Proponent if, in the judgment of the TEC, such Proposal contains materially false, incorrect, or misleading information or reveals a Conflict of Interest that the TEC is not prepared to waive in its discretion. The provisions of this Section shall survive any cancellation of this RFP and the conclusion of this RFP process.

2.9 No Implied Offer or Binding Commitment

No contract or other binding obligation on the TEC or any member of the TEC group will be implied (by law or otherwise) unless and until the utilities and the Proponent have executed the Services Agreement on terms and conditions acceptable to the utilities.

2.10 Media Release

No news release, advertisements, announcements or other communication pertaining to this RFP, the RFP Documents, the Proposal or the Services will be issued by any Proponent.

2.11 Incurred Costs

The Proponent participates in this RFP process at its sole discretion and risk. The Proponent is solely responsible for all costs of preparing and submitting its Proposal and any other prior or subsequent activity associated with the RFP process, including Proponent presentations, meeting attendance, due diligence and/or contract negotiations, regardless of whether or not the utilities, on behalf of the TEC, enters into a Services Agreement with the Proponent. No honorarium or reimbursement shall be provided to any of the Proponents.

2.12 Governing Law

The relationship of Proponent and the TEC and the members of the TEC group will be governed by the laws of the Province of Ontario and the laws of Canada applicable therein.

2.13 Addenda

The RFP may only be amended by addendum (an "Addendum" and collectively, the "Addenda") which will become part of the RFP. Clarification or information provided orally by the any member of the TEC group, the Primary Contact or any other person is not binding on the any member of the TEC group and should not be relied on by any Proponent unless a confirming Addendum is issued. Proponents shall submit with their Proposal written confirmation of the receipt of all Addenda during the RFP period.

Section 3 – RFP Information and Instructions

3.1 Title

RFP-002-2013 - Measuring Net-to-Gross (NTG) Estimates for Ontario's Natural Gas Custom Commercial and Industrial Demand Side Management (DSM) Programs.

3.2 Designated Contact Person for this RFP

Haris Ginis
Program Evaluator
Union Gas Ltd
416-496-5240
hginis@uniongas.com

Please submit all questions and other communications regarding this RFP to the designated contact person listed above. Unless authorized specifically in writing by the designated contact person, neither the Proponent (nor any representative of the Proponent) shall, directly or indirectly, contact or attempt to contact any director, officer, employee, representative, consultant or agent of the any member of the TEC group, other than the designated contact person, in respect of any aspect of this RFP process or the Proposal. Failure to comply may result in disqualification of the Proponent from further consideration by the TEC.

3.3 Schedule of Activities

Activity	Due
Issue Date of RFP	November 1, 2013
Intent to Bid and Conflict of Interest Notice	Noon (EST) December 2, 2013
TEC Eligibility Responses Due	December 2, 2013
Proposal Submission Due Date	5pm (EST) December 23, 2013
Proposal Selection	Week of January 27, 2014
Anticipated Project Start-Up Meeting and Review of Initial Documents	February 2014

The TEC reserves the right to modify this schedule at its discretion.

Potential proponents are required to submit a notification of intent to submit a proposal along with both a statement of conflict or potential conflict of interest and the identification of any financial relationships the proponent (or its subcontractors) has with members of the TEC group by Noon EST on December 2, 2013. Proponents are advised not to prepare bids until their eligibility has been determined and communicated by the TEC.

For the purposes of this RFP, a conflict of interest exists when there is a professional interest (financial or otherwise) that could hinder your firm in providing objective insight and un-biased direction to the findings or recommendations from this study.

Questions regarding this RFP must be submitted by email to the Designated Contact Person listed in section 2.2 prior to the close of the question period.

3.4 Proposal Submittal Deadline

Proponents are required to submit electronic versions of their proposals to:

Haris Ginis
Program Evaluator
Union Gas Ltd
416-496-5240
hginis@uniongas.com

The proposal should be submitted in Adobe Acrobat format. An electronic receipt will be sent to those who submit proposals by 5 **pm EST on December 23, 2013**.

Late proposals will be rejected.

3.5 Contract Award

The TEC will notify all proponents of the contract award decision by email. The anticipated award date is specified in Section 3.3 Schedule of Activities.

3.6 Anticipated Project Budget

The project budget for this study will be as determined by the TEC after reviewing the proposals submitted in this RFP. For the guidance of the proponents, the preliminary budget for the Measurement of Net-to-Gross (NTG) Factors of Ontario's Natural Gas Custom Commercial and Industrial Demand Side Management (DSM) Programs pursuant to this RFP is $400,000 CAN.

Applicants are welcome to propose additional study objectives or tasks that could increase the accuracy and/or understanding of research data and how they could be applied to future DSM growth and industry's best practices. All additional activities should be described and priced separately in the response to this RFP.

Appendix A – Summary of Commercial and Industrial Natural Gas Custom Programs

Enbridge Gas Distribution

The following summary of the Enbridge programs was prepared by Enbridge Gas Distribution.

1. Commercial Custom Savings Program

Target Market:

- Large and medium sized customers in all segments of the Commercial sector which includes institutional and multi-family.

Program Goals:

Reduce natural gas use through the capture of cost effective energy efficiency opportunities.

Program Strategy:

Enbridge offers a variety of incentive, service and educational based initiatives to Commercial sector customers. Given the myriad of building types and end-uses, ownership structures and leasing arrangements, the Commercial sector is a complex market in which to deliver energy efficiency. The initiatives offered under the Commercial Sector Custom program rely on a combination of outreach, consultation, education and incentives to encourage commercial customers to undertake energy efficiency investments.

Existing Buildings Custom Projects:

The custom project portfolio is aimed primarily at medium and larger users, providing them with support to identify energy saving opportunities, customized energy savings calculations, feasibility studies, and access to financial incentives. The program's main focus is on projects where multiple technologies are considered and where customized energy savings calculations are required. The size and complexity of custom projects often requires Enbridge support through a project development process lasting several months or even more than a year.

Energy Compass and Run It Right:

In 2012, Enbridge launched two new initiatives which encourage a continuous improvement strategy for larger commercial customers. These programs build on the Company's history of working with customers to identify single capital investment and operational improvement projects. Now, through an ongoing customer relationship, the Company will help customers to prioritize energy efficiency investments across their portfolio of buildings, implement efficiency measures, monitor building performance and operate their buildings at peak efficiency. More specifically, Energy Compass is a benchmarking program that is designed to help customers identify and focus their efforts on high energy intensity buildings. The program alone will not claim energy savings per se, but rather is an enabling program that will lead to the identification of energy efficiency opportunities. The Run It Right

program (operational improvements) launched in 2012 requires a full year of energy monitoring; as a result savings will not be reported until 2013.

Summary:
Enbridge has an important role to play, directly and indirectly, in knowledge development, opportunity identification, measurement, engineering analysis and assisting customers with action and implementation, including financial support. By creating these added value partnerships and offerings, customers, business partners and Enbridge have a vested interest in working together towards measured savings. Through its expertise and unique access to a variety of delivery agents, Enbridge can identify and stimulate appropriate energy solutions directly with customers or indirectly by supporting their business partners.

The custom project portfolio is aimed primarily at medium and larger users, providing them with support to identify energy saving opportunities, customized energy savings calculations, feasibility studies, and access to financial incentives. Participation in the custom project portfolio has primarily come from boiler and building control projects, including but not limited to demand control ventilation, variable frequency drives as well as other energy efficiency measures such as operational improvements, building envelope and heat recovery.

2. Industrial Custom Savings Program

Target Market:
Targets market segments include:

- Large, medium and small industrial customers with requirements for industrial process heat, space heating, and water heating.

Program Goals:
Support industrial customers to achieve energy savings through a continuous improvement approach.

Program Design:
The Enbridge industrial program is designed around a continuous energy improvement cycle which includes five steps: Knowledge Development, Opportunity Identification, Measurement, Engineering Analysis, and Action & Implementation. Enbridge Energy Consultants work hand in hand with customers every step of the way, to remove the specific barriers that arise for each customer in implementing energy efficiency projects.

Knowledge Development: involves educating our customers with the knowledge necessary to implement energy efficiency projects. This is done through technical publications and in-person workshops on topics from energy efficient technologies, to new energy management standards.

Opportunity Identification: involves helping customers identify specific opportunities to improve their energy efficiency. Enbridge has a staff of experts, which work directly with customers to identify opportunities through various on-site assessments. Enbridge has specialized testing equipment that can be used for boiler, process heating, heating & ventilation and thermal imaging assessments. If an expert

is needed, Enbridge has funding available to offset the cost of a 3rd party consultant. Enbridge staff can assist the customer in writing the scope of work to ensure the best possible result.

Measurement: Data is a key element for customers when making informed decisions about their energy use. Enbridge staff can assist customer in identifying what information is most important and the most effective way to measure it. Enbridge also offers incentives towards purchasing measurement equipment, including meters and data acquisition.

Engineering Analysis: Enbridge staff provides analysis for customers in a variety of forms. From interpretation of data, to mass and heat balance calculations, Enbridge staff will assist customers in quantifying the energy savings and costs associated with efficiency opportunities and assist them in building the business case for management. If an expert is required, funding is available for a third party consultant.

Action & Implementation: Enbridge staff can connect customers with product information and business partners to facilitate the project. Finally, funding is available to help offset the cost of energy efficient projects. Enbridge Energy Solutions Consultants work with each customer to overcome barriers to implementing a project.

The following summary of the Union programs was prepared by Union Gas Limited.

1. Commercial and Industrial Custom Savings Program

Target Market:

Targets market segments include:

- New and existing commercial buildings in all segments of the commercial sector.
- Industrial process heat, space heating and water heating.

Program Goals:

To generate long-term and cost-effective energy savings for customers Union Gas:

- Promotes the identification of energy saving measures through proper analysis.
- Encourages the procurement and utilization of energy-efficient equipment and processes.
- Encourages the adoption of operations and maintenance actions.
- Encourages the adoption of process related improvements.
- Supports a continuous and wide-scope focus on energy management practices.
- Increases energy awareness through education and training initiatives.

Program Strategy:

Union Gas provides dedicated technical expertise to assist customers in obtaining value from the identification, adoption and implementation of energy efficient actions throughout their sites, facilities and operations. Union Gas engages customers to increase awareness surrounding the positive benefits achieved through active energy management. Customers are provided financial incentives and education/training initiatives that are value-added; this encourages customers to focus on continuous energy management as an integral part of their operations and practices.

Program Offerings:

Union Gas continues to encourage the adoption of energy efficient equipment, technologies and actions through direct customer interaction.

The program offerings ensure customers have access to education and awareness initiatives, technical assistance and financial incentives, supporting the continuous improvement approach (Plan/Do/Check/Act) to active energy management.

Program offerings include:

- Customer Engagement: Communication and Education
- Engineering Feasibility and Process Improvement Studies
- Operation and Maintenance Practices
- New Equipment and Processes
- Energy Management

Customer Engagement: Communication and Education:

Union Gas provides education, training and technical expertise and offers a wide variety of materials aimed at building an increased awareness of energy-efficiency opportunities and benefits.

Engineering Feasibility and Process Improvement Studies:

Union Gas supports the completion of studies to identify and quantify potential energy savings measures. Furthermore, Union Gas supports comprehensive process improvement studies to determine and assess financial costs and benefits of energy-efficiency opportunities, supporting the customer's internal decision making process.

Operation and Maintenance Practices:
Union Gas provides financial incentives to support the completion of operation and maintenance actions and practices which result in saving natural gas, and which may also increase energy-efficiency and/or improve productivity of customers' operations. These incentives are available for customers, with or without an engineering feasibility or process improvement study.

New Equipment and Processes:
Union Gas provides financial incentives to support the installation of new equipment and processes which result in saving natural gas, and which may also increase energy-efficiency and/or improve productivity of customer's operations. These incentives are available for customers, with or without an engineering feasibility or process improvement study.

Energy Management:
Union Gas provides financial incentives to support the installation of energy meters, monitoring and management systems, allowing customers to manage the energy intensity of their operations actively and continuously.

Market Delivery:
The program offerings are delivered directly to customers by dedicated Union Gas Account and Project Managers; energy experts who are knowledgeable about individual customer's businesses, operations and processes.

Collaboration with key organizations, original equipment manufacturers, vendors, suppliers and consultants is required to expand the reach of Union's program offerings, educate customers and encourage the adoption of energy-efficiency best practices. Furthermore, these collaborations develop customer's capacity to make informed energy-efficiency decisions while helping to promote the investigation and implementation of energy-efficiency projects.

2. Large Industrial Rate T1/Rate 100 Program (New program 2013 and beyond)

Target Market:

- Large industrial customers (Rate T1, Rate T2 and Rate 100)

Program Goals:

- Provide customers (Rate T2/Rate 100) with direct access to their associated incentive funds for a set period of time, allowing these customers the planning certainty to incorporate energy-efficiency incentives into their operations and providing flexibility for these customers to align funds with corporate initiatives.
- Provide all Large Volume customers with the tools, expertise and support to incorporate energy-efficiency into their everyday operations and practices through continuous improvement.
- Promote the identification of energy saving measures through proper analysis techniques.
- Encourage the procurement and utilization of energy-efficient equipment and processes.
- Encourage the adoption of operations and maintenance actions and process improvements that support a continuous focus on energy management.

- Generate long-term and cost-effective energy savings for customers, to enable increased competitiveness in the global economy.

Program Strategy:
To achieve these program goals, Union will provide dedicated technical expertise to assist customers in obtaining value from the identification, adoption and implementation of energy efficient actions throughout their sites, facilities and operations. Union will engage customers to increase awareness surrounding the positive benefits achieved through active energy management. Customers will be provided financial incentives and education/training initiatives that are value-added; this will encourage customers to focus on continuous energy management as an integral part of their operations and practices.

Program Offerings:
Consistent with the 2012 Program, Union will continue to encourage the adoption of energy efficient equipment, technologies and actions through direct customer interaction. The program offerings have been developed to ensure customers have access to education and awareness initiatives, technical assistance and financial incentives, supporting the continuous improvement approach (Plan/Do/Check/Act) to active energy management.

The following are the Program offerings:

- Customer Engagement: Communication and Education
- Engineering Feasibility and Process Improvement Studies
- Operation and Maintenance Practices
- New Equipment and Processes
- Energy Management

<u>Customer Engagement: Communication and Education:</u>
Union will provide education, training and technical expertise to Rate T1, Rate T2 and Rate 100 customers. Customers will be offered a wide variety of materials aimed at building an increased awareness of energy-efficiency opportunities and benefits. Union's targeted and connected set of initiatives afford Rate T1, Rate T2 and Rate 100 customers the opportunity to incorporate continuous energy management into their operations.

<u>Engineering Feasibility and Process Improvement Studies:</u>
This offering will support studies to identify and quantify potential energy savings measures. Furthermore, the offering will support comprehensive process improvement studies to determine and assess financial costs and benefits of energy-efficiency opportunities, supporting the customer's internal decision making process.

Appendix B – Custom Free Ridership Study (2008) prepared by Summit Blue

CUSTOM PROJECTS ATTRIBUTION STUDY

FINAL

Submitted To:

DSM Evaluation
Union Gas Limited – A Spectra Energy Co.
Enbridge Gas Distribution

October 31, 2008

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TABLE OF CONTENTS

E EXECUTIVE SUMMARY

Enbridge Gas Distribution (EGD and Union Gas deliver DSM programs to customer in their respective franchise areas.

In 2006, the Ontario Energy Board (OEB) convened a Generic Proceeding on the subject of natural gas DSM. Through the Proceeding, the OEB approved the utilities' DSM plans for the three-year period 2007 through 2009, including assumptions for measure savings and free ridership. Items identified as priorities for evaluation research included a free ridership study of the Custom Projects programs.

This report presents the results of market research conducted by Summit Blue Consulting, LLC/Summit Blue Canada, Inc. ("Summit Blue") during the winter of 2007-2008 to measure free ridership and spillover for the Custom Projects programs.

E.1 Definitions

To assist the reader in understanding the terms used throughout the document, Summit Blue has provided definitions for the following terms:

Free Ridership: Free riders are customers who received an incentive through an efficiency program, yet would have installed the same efficiency measure on their own had the program not been offered. This includes partial free riders, defined as customers who, at some point, would have installed the measure anyway, but the program persuaded them to install it sooner than otherwise.

Spillover represents energy savings that are due to the program but not counted in program records. Spillover can be broken out in three ways:

- **Participant inside spillover** represents energy savings from other measures taken by participants at participating sites not included in the program but directly attributable to the influence of the program.

- **Participant outside spillover** represents energy savings from measures taken by participants at non-participating sites not included in the program but directly attributable to the influence of the program.

- **Non-participant spillover** represents energy savings from measures that were taken by non-participating customers but are directly attributable to the influence of the program. Non-participant spillover is sometimes called the "Free-Driver effect."[1]

[1] See for example California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals. TecMarket Works. Prepared for the California Public Utilities Commission. April 2006. Page 226.

Net-to-Gross Ratio: Gross impacts are the program impacts prior to accounting for program attribution[2] effects. Net impacts are the program impacts once program attribution effects have been accounted for. The net-to-gross ratio is defined as 1 - free ridership ratio + spillover ratio.

E.2 Study Overview

The study included the following research tasks performed during the winter of 2007-2008:

- Development of a project analysis plan detailing the study's methodology
- A history and critique of the methods that have been used to estimate free ridership and spillover in nonresidential programs.
- On-site interviews (plus a few telephone interviews) with participants and participating trade allies.
- Telephone interviews with customers who had a program-supported energy audit but had not implemented any measures through the program.
- Telephone surveys with nonparticipants to look for and quantify nonparticipant spillover.
- An analysis and scoring of the data to produce the free ridership and spillover estimates.

E.3 Free Ridership Results

The total free ridership rate across both utilities and all sectors is 48% as shown in Table E-1. The free ridership rate for EGD is 41% and it is 54% for Union Gas. Summit Blue recommends that the utilities use the utility-specific total free ridership values of 41% and 54% as the best estimate of free ridership. Those results are based on larger sample sizes than the sector-specific results and proved more stable in the sensitivity analysis. The sector-specific results are based on smaller sample sizes and should only be used to support program management, for example to support targeting and marketing decisions.

[2] For purposes of this study, attribution is defined as the influence the program has had on customers installing the target measure when they otherwise would not have done so, including inside spillover influences to take additional energy efficiency measures.

Table E-1. Free Ridership Results

Sector	EGD	Union	Total
Agriculture	40%	0%	18%
Commercial Retrofit	12%	59%	27%
Industrial	50%	56%	53%
Multifamily	20%	42%	26%
New Construction	26%	33%	28%
Total	41%	54%	48%

Assumptions (See Figure 2.1 for the interpretation of these assumptions):

Weight of Participant Reported Importance [F] in [K] compared to the planning [H] and influence [G] scores	Triple weight
Weight of Project-based estimate [14] in [20] compared to the measure-specific scores [9]	Triple Weight
Weight of Program Influence Score [L] compared to the Project-Based score [21]	Equal Weight

E.4 Spillover Results

Participant inside spillover, representing additional energy efficiency measures installed at the participant's same facility without going through the program, is 5% of gross reported savings for both EGD and Union.

Participant outside spillover, representing additional energy efficiency measures at *different* facilities without going through the program, is 5% combined across both utilities.

Customers who received an audit, implemented a recommended measure, but did not receive incentives through the program for that measure can be considered audit-only spillover. The audit-only spillover survey and analysis was completed for EGD only as Union Gas was unable to find any companies who had an audit in 2005 and had not implemented one of the recommended measures through the program. As a result, the savings inspired by the Union Gas audits will appear in the program tracking data rather than in spillover. For EGD, 35% of the gross recommended savings from energy audits were achieved, representing the audit-only spillover.

A screening survey of 1,228 non-participants found that 5.4% of non-participants were influenced by the program to implement measures (and did not receive a financial incentive). The study could not accurately calculate the m^3 savings from the respondents so the non-participant spillover was not factored into the net-to-gross ratio.

Summit Blue recommends the utilities use following spillover rates:

Table E-2. Spillover Results

Spillover Type	EGD	Union	Base
Participant Inside Spillover	5%	5%	Of gross reported savings
Participant Outside Spillover	5%	5%	Of gross reported savings
Audit-Only Spillover	35%	0%	Of gross audit-recommended savings
Nonparticipant Spillover	0%	0%	

E.5 Net-to-Gross Ratio

The net-to-gross ratio is defined as 1 - free ridership ratio + spillover ratio. As discussed above, spillover is in several parts: participant inside and outside spillover, audit-only spillover, and non-participant spillover. We know that 5.4% of the non-participants have spillover but cannot calculate its quantity so the calculation of net-to-gross in this report excludes it. Summit Blue recommends that the utilities use the utility-specific total net-to-gross ratios of 79% for EGD, 56% for Union, and 67% across both utilities as shown in the following table. As with the free ridership results, these recommended net-to-gross results are based on larger sample sizes than the sector-specific results.

Free ridership is calculated quite frequently in impact analysis studies. In the early days of attribution research, spillover was not often considered but over the past few years more and more jurisdictions are taking spillover into account along with free ridership. For example, California is now implementing studies to measure market transformation effects and spillover from its programs. NYSERDA takes both free ridership and spillover into account. Minnesota believes free ridership and spillover effectively cancel each other out. It is increasingly viewed that if programs are going to see their results discounted for free ridership that a more accurate view of net impacts can be had by adding in spillover. In 2006, Summit Blue researched the free ridership and spillover rates that have been found in studies in recent years. The 79% net-to-gross ratio for EGD is in the same range as several of the programs examined. The 56% ratio for Union Gas is lower than those found in this research.

Table E-3. Net-To-Gross Ratio

Utility	Sector	Free Ridership	Participant Inside + Outside Spillover	Audit-Only Spillover %	Net-to-Gross Ratio
EGD	Agriculture	40%			
EGD	Commercial Retrofit	12%			
EGD	Industrial	50%			
EGD	Multifamily	20%			
EGD	New Construction	26%			
EGD	Total	41%	10%	11%	79%
Union	Agriculture	0%			
Union	Commercial Retrofit	59%			
Union	Industrial	56%			
Union	Multifamily	42%			
Union	New Construction	33%			
Union	Total	54%	10%	0%	56%
Total	Agriculture	18%			
Total	Commercial Retrofit	27%			
Total	Industrial	53%			
Total	Multifamily	26%			
Total	New Construction	28%			
Total	Total	48%	10%	5%	67%

Free Ridership Assumptions (See Figure 2.1 for the interpretation of these assumptions):

Weight of Participant Reported Importance [F] in [K] compared to the planning [H] and influence [G] scores	Triple weight
Weight of Project-based estimate [14] in [20] compared to the measure-specific scores [9]	Triple Weight
Weight of Program Influence Score [L] compared to the Project-Based score [21]	Equal Weight

E.6 Limitations

Three areas typically form the basis for research projects' constraints and limitations including: budgetary constraints, time constraints and reliability of data. This study, like most research, encountered constraints and limitations and they are documented below.

Budgetary Constraints

- Given sufficient time and budget, it is possible to survey every participant in a program and produce a precise calculation of a given characteristic across the entire population. However, it is typically not possible or desirable (except perhaps for very small programs) to have a budget large enough for that level of effort. As a result, free ridership studies are most often done with a sample of participants. The estimate based on that sample has an error bounds around it, and the error bounds is determined by the sample size and the variance in the result from the sample. As with most such studies, the current study used a sampling approach but with a sample designed to be sufficient to provide a result at the 90/10 confidence level, which means we are 90% confident that the mean free ridership from the sample is within 10% of the mean free ridership in the population.

Time Constraints

- The study was conducted on custom projects that were completed between the fourth quarter of 2006 and the third quarter of 2007. It is possible that the characteristics of participants and projects in a custom project program may change over time in response to changing conditions in the region. Ideally, changes in program implementation efforts also discourage free riders from participating and thus also bring about a change in the population of participants. To the extent that the characteristics of the population of participants changes over time, the results of a given study have less predictive power for the new population. When a relatively small number of participants has a particularly large impact on the free ridership value, as with the current study, changes in the population of participants could have a significant effect on future free ridership results.

- Self-report free ridership studies like the current study depend— by design— on respondents recalling events from the past. Ideally, the interviews on which to base these studies are done as soon as possible after pivotal decisions are made for each project. C&I custom projects often have a long lead time, sometimes measured in years. Thus some projects in the current study could have been incubating from as early as 2004. The time lag between when a project is conceived or key decisions are made and when the free ridership interview was completed may mean that crucial information is unavailable to the interviewer. Key decision-makers may have forgotten details or even moved from the participating company. The study included efforts to remind respondents of the history of their interaction with the program but this can never bring the entire history of a decision back to mind. While the risks here could skew results toward higher or lower free ridership values, it is more likely that these factors will produce higher free ridership values than the opposite.

Reliability of the Data

- The free ridership interviews were completed by four separate individuals. Most were done in-person and some Union Gas interviews were done by phone. The key questions that affect the free ridership results were precisely worded and all interviewers were carefully trained. However the interviews were designed to be more like free-flowing conversations than highly-scripted surveys. The interviewers were instructed to probe for details and follow lines of thought to their natural conclusions rather than stick strictly to a set script. As a result, some variations from one interviewer

to the next are inevitable and they may affect the bottom line results. The results were examined to look for evidence of interviewer bias but no patterns were evident.

- As discussed above, the study is dependent on respondents' memory of past events. This is magnified in some circumstances when one respondent is responsible for providing answers on several different projects. The sample was picked at the project level, that is, projects were picked for the sample rather than participants. However, participants may have implemented more than one project in the study period. In those cases, we surveyed the respondent once but asked them separately about the individual projects. Given the reliance on Channel Partners, in the Union Gas sample 77 projects were covered by interviews with 52 respondents. The extent to which respondents were unable to distinguish in their head between one project and another will be reflected in the inaccuracy of their responses.

1 INTRODUCTION

This section gives a brief background on the purpose of the research, describes the utility programs, and introduces the organization of the report.

In 2006, the Ontario Energy Board (OEB) convened a Generic Proceeding on the subject of natural gas DSM. Through the Proceeding, the OEB approved the utilities' DSM plans for the three-year period 2007 through 2009, including assumptions for measure savings and free ridership. Items identified as priorities for evaluation research included a free ridership study of the Custom Projects programs.

Summit Blue Consulting, LLC/Summit Blue Canada, Inc. ("Summit Blue") were retained by Union Gas Ltd. (Union Gas) and Enbridge Gas Distribution (Enbridge) (jointly, the Utilities) to conduct a forward-looking evaluation of program influence attribution for free ridership and spillover associated with the Custom Projects programs offered by the Utilities.

The study included the following research tasks performed during the winter of 2007-2008:

- Development of a project analysis plan detailing the study's methodology
- A history and critique of the methods that have been used to estimate free ridership and spillover in nonresidential programs.
- On-site interviews (plus some telephone interviews) with participants and participating trade allies.
- Telephone interviews with customers who had a program-supported energy audit but had not implemented any measures through the program.
- Telephone surveys with non-participants to look for and quantify non-participant spillover.
- An analysis and scoring of the data to produce the free ridership and spillover estimates.

1.1 Utility Programs

Both Union and Enbridge operate DSM programs that include custom projects for the Commercial and Industrial sectors. Custom projects cover opportunities where savings are linked to unique building specifications, uses and technologies. Each project is assessed individually for participation in the program.

1.2 Report Organization

This chapter (Chapter 1) outlines the purpose of the study, background on utility programs and the report organization. Chapter 2 describes the methodology used to assess free ridership and spillover. Chapter 3 presents a history and critique of free ridership methodologies. Chapter 4 presents the sampling strategy and sample disposition. Chapter 5 presents the results of our research. Chapter 6 presents supplementary results. Finally, Chapter 7 presents our conclusions.

2 METHODOLOGY

This section presents a high-level overview of the methods and data sources used to conduct the study. Full details are included in Appendix A in the revised Analysis Plan.

2.1 Free Ridership

Free ridership and spillover were estimated using data from surveys with participants, non-participants, trade allies, and utility staff. This approach is based primarily on participant self-reported information along with other perspectives to triangulate the net-to-gross estimates.

Experienced utility industry consultants conducted the interviews and most were done on-site at the participant's premise. To address the possibility of respondent bias, the interviews approached each topic from a variety of directions. The interviewer had the discretion to probe for supporting information and the analysis process checks for consistency across answers. Interviewees were promised confidentiality and assured that their answers will not affect the incentives or support they have received from the program. To address the possibility of interviewer bias, each interviewer was trained in the purpose of the research and the importance of objectively probing and recording responses. Four different interviewers performed the interviews and the data from their interviews were compared to look for uneven application of the methodology.

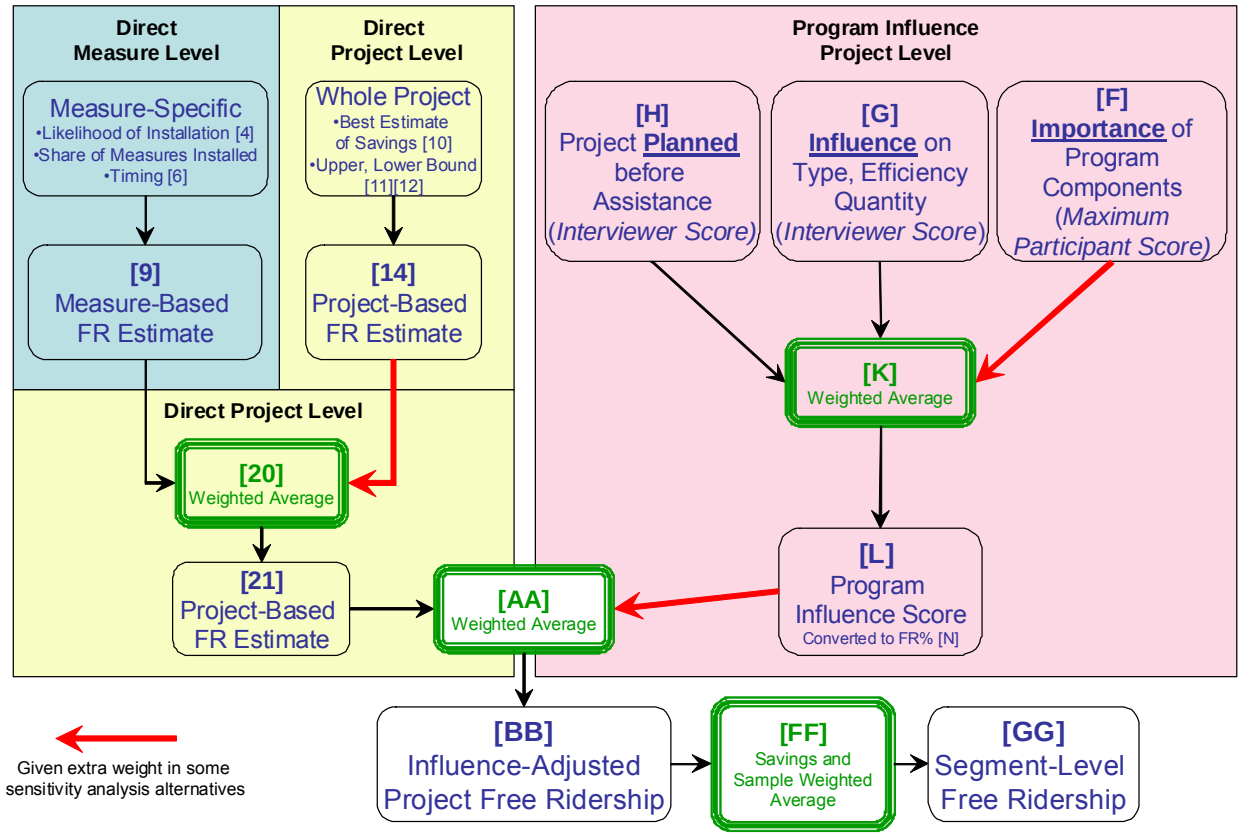
Figure 2-1 presents an overview of the survey and analysis approach. Key points in the diagram are labeled with numbers and letters in square brackets, which we will refer to below. Free ridership was discussed with each respondent in both **direct questions** aimed at obtaining respondent estimates of the appropriate (full or partial) free ridership rate to apply to them (represented by the large box on the left side of the diagram), and in **supporting or influencing questions** used to verify whether direct responses are consistent with participants' views of the program's influence on their equipment investment decisions (represented by the large box on the right side of the diagram). The direct questions were asked at the measure level [4] and [6] and at the whole project level [10]. They were then combined into a single, project-level direct free ridership score at [21]. Direct and program influence scores are combined into the final project-level free ridership score at [BB]. That project-level score is weighted by program-reported savings and sample weights [FF] to calculate the final savings-weighted free ridership percentage [GG].

Key calculations were examined in a sensitivity analysis to determine their effect on the final result. Three assumptions feeding into those calculations were found to have the most effect on the end result. Those assumptions relate to the weight given to various answers or answer categories in averages with other answers. The key calculations are shown at [20], [K], and [AA] in the calculation overview diagram. The sensitivity analysis tested the effect of increasing the weight given to [14] in the calculation at [20], the weight given to [F] in the calculation at [K], and the weight given to [L] in the calculation at [AA] (each represented by a thicker, red arrow).

Free ridership results were first calculated on the measure level. The measure-level gross and net savings are summed up across all customers and then net savings divided by gross savings produces the final savings-weighted, program-wide free ridership result. (Sample weights are applied during the summing step.)

Enbridge Gas Distribution designates some projects as "advancement" when they judge that the program moved a project forward in time. The designation of a project as an advancement project does not affect the annual savings but it does affect the TRC calculation. In their TRC calculations for advancement projects, EGD discounts the benefits and adjusts the incremental costs to account for the period which the program has moved projects forward in time. The current study addresses first-year annual savings only, it does not extend benefits and costs over time and does not include a cost/benefit analysis. On a measure-by-measure basis, respondents were asked if the program influenced them to install the equipment more than one year earlier than they otherwise would have otherwise [6]. If it did, the measure-level free ridership score is discounted in [9] in the diagram below. Several different scales were examined for discounting the free ridership score based on the number of months the project was brought forward in time. The final, utility-level free ridership score did not move significantly in that analysis. Because this study was focused on first-year savings only, it was agreed that the appropriate approach was to include this adjustment for all projects, including advancement projects. This is in keeping with standard practice in calculating free ridership. All respondents were asked the timing question [6] and their answers were accounted for in [9] whether they were being asked about an advancement project or not. Given the math of the calculation, the only possible effect of removing the timing question for advancement projects would be to **increase** the free ridership rate.

Figure 2-1. Free Ridership Analysis Overview



2.2 Spillover

Spillover represents energy savings that are due to the program but not counted in program records. Spillover can be broken out in three ways:

- **Participant inside spillover** represents energy savings from other measures taken by participants at participating sites not included in the program but directly attributable to the influence of the program.

- **Participant outside spillover** represents energy savings from measures taken by participants at non-participating sites not included in the program but directly attributable to the influence of the program.

- **Non-participant spillover** represents energy savings from measures that were taken by non-participating customers but are directly attributable to the influence of the program. Non-participant spillover is sometimes called the "Free-Driver effect."[3]

Summit Blue estimated **participant inside and outside spillover** through questions in the participant and trade ally surveys and through the Audit-Only Survey. Summit Blue estimated non-participant spillover through the non-participant survey.

The surveys did not address whether the respondent received funding from other sources to facilitate the energy efficiency measures. The survey questions were designed to designed to determine if the Custom Projects program was influential in the decision to install the spillover measure and if so the share of the savings from the extra equipment that can reasonably be attributed to the influence of the program. Given that approach, funding from other sources, if any, would not change the conclusions drawn from the survey. Even with other funding, if the utility program support was critical in convincing the respondent to implement the energy efficiency measure, then it should get credit for some of the savings.

2.2.1 Participant Inside and Outside Spillover

The spillover questions were incorporated in the participant and trade ally surveys and the spillover analysis was implemented in concert with the free ridership analysis.

For **inside spillover**, respondents are asked whether their experience with the programs caused them to install additional energy efficient equipment at the site that did not go through the program. This establishes whether inside spillover exists. For those respondents reporting that additional measures were installed, they are asked to identify in which year(s) the measures were installed, and to describe how the program influenced their decisions to install additional energy efficient equipment at their facility. An additional question is asked to determine the ratio of the savings from these additional measures compared to the savings from the measures installed under the program. That is, they are asked the percent of savings as a multiple of the savings achieved under the program (**savings multiplier**). Finally,

[3] See for example California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals. TecMarket Works. Prepared for the California Public Utilities Commission. April 2006. Page 226.

respondents are asked to estimate the share of the savings from these additional measures that can "reasonably be attributed to the influence" of the program **(net-to-gross percentage)**.

Inside spillover is zero for those without additional measures (or those who failed to answer all of the questions), and it is the product of the savings multiplier and the net-to-gross percentage for those with inside spillover. Similar to the free ridership analysis, individual spillover estimates are weighted both by relative energy savings for each respondent, as well as by sample stratification to determine an inside spillover value for the group as a whole.

Similar to inside spillover, for **outside spillover**, respondents are asked first whether the influence of the program caused them to install any additional energy efficiency equipment, outside of the program, at other sites beyond what they would have done without their experience with the program. If they respond yes, they are asked several follow-up questions designed to provide an estimate of the level of savings from these actions that could be attributed to the program.

For outside spillover, the savings as a percent of the in-project measure is multiplied by the share of savings attributed to the program to calculate the outside spillover value.[4] Similar to the free ridership analysis, individual spillover estimates are weighted both by relative energy savings for each respondent, as well as by sample stratification to determine an outside spillover value for the group as a whole.

2.2.2 Audit-Only Spillover

Participants who received an audit, implemented a recommended measure, but did not receive incentives through the program for that measure can be considered spillover. These kinds of participants would not be included in either the participant or non-participant surveys. We implemented a survey specifically with this population and focusing solely on spillover measures to provide an additional estimate of program spillover.

The interviewer asks the respondent if they recall receiving the audit. If they do not, the interviewer attempts to speak to someone else who might recall the audit. The interviewer asks the participant about each measure recommended in the audit. (Although we will limit this to the measures with the largest savings if there are more than 5 measures recommended.) The interviewer examines whether the respondent remembers the recommendation and whether it has been installed and when. If the participant installed a measure, the interviewer asks the following:

> 1. On a scale of 1 to 5 where 1 is "no influence" and 5 is "a great deal of influence", how much influence did the audit have in your decision to implement this measure?
>
> 2. What share of the savings from this measure can reasonably be attributed to the influence of the program?

The analysis of audit-related spillover savings is fairly straightforward. The program tracking data have measure-specific savings estimates from the audit. The two influence scores are converted to the same scale and averaged. That average is applied to the audit savings to calculate audit-related spillover savings.

[4] A cap of five outside spillover projects per respondent is used to prevent outliers from skewing the results.

2.2.3 Non-Participant Spillover

Summit Blue estimated non-participant spillover using a survey targeted at non-participants only. The approach to the data collection and analysis took the following steps:

1. Obtain sample of non-participants from the utilities

2. Execute telephone screening survey to identify customers who had implemented relevant measures and were influenced by the program.

3. Conduct engineering follow-up interview to estimate savings from those measures influenced by the program.

The screening survey went through the following steps:

1. Find someone knowledgeable about the replaced or modified equipment.

2. Are they aware of the program? If no, terminate.

3. Did the company participate in the program in the past 3 years? If yes, terminate.

4. Has the company modified or installed equipment that might fall under the program's incentives since the beginning of 2005? (List target equipment.) If no, terminate.

5. Determine what effect, if any, the program had on their decision. If none or little, terminate.

6. Obtain permission for the follow-up engineering call.

In the engineering follow-up call Summit Blue engineers asked enough questions about the equipment to make an engineering estimate of the energy savings it produces.

3 HISTORY AND CRITIQUE OF FREE RIDERSHIP METHODOLOGIES

This chapter was designed to analyze the methods used to assess both free riders and spillover for customized programs targeted to the commercial and industrial sector. Summit Blue conducted a literature review of methodology development and assessment and current practice, compared the various methods, and drew conclusions on the most appropriate method to use for C&I custom projects programs.

The recommended method to assess free riders and participant spillover is self-report in-person and telephone surveys with participants and market players. Issues such as self-selection bias would be controlled by using enhancements such as interviews with multiple decision makers at sampled sites, multiple question areas to address program influence on decision making, and well-thought out scoring algorithms. The market share method of estimating free ridership is not appropriate for custom projects with large customers mainly because the programs are focused on custom projects rather than promotion of specific equipment. Market sales methods rely on good equipment sales data and work best with programs targeted at measures that are uniform across applications and very specific definitions of technology. Econometric methods including billing analysis and discrete choice modeling are not applicable for C&I custom programs because large customers may skew the results, custom projects are less amenable to standardized approaches, difficulties with identifying comparable non-participant groups cast doubt on the validity of the model, the lack of good historical data (except for consumption) limits their scope, and the need to estimate a proportion rather than magnitude of net savings and the requirement to assess spillover limit their usefulness.

Self-report and econometric analyses have merit and often provide similar results. For example, a study by Torok in 1999 found consistent results from self-report, billing, and discrete choice analysis; net-to-gross (NTG) results for self-report and discrete choice methods differed by less than one percent. The study looked at the three methodologies used to estimate net impacts for Pacific Gas & Electric's Commercial Energy Efficiency Program, which provided prescriptive rebates for equipment as well as funding for custom projects (gas or electricity). The authors preferred the two stage discrete choice model, but recommended the continued use of multiple approaches. Most econometric methods for NTG require survey information; the more they rely upon self-report data, intentions, and psychographic data, the more they are likely to have some of the same measurement issues as the survey-based approach. Billing analysis can produce biased results because of participant self-selection into programs; this can be dealt with by various statistical methods which unfortunately require excluding large customers as they can skew the results.

3.1 Background & Development of Methodology

This section briefly outlines the history of evaluation of social actions and the development of evaluation methodology to assess free riders and spillover effects.

Evaluation is rooted in the empirical study of social problems in Britain in the 1660s with the first evaluative studies published in the 1800s, looking at the impact of education on crime or the usefulness of

public works, for example. However, until quite recently, most policies and programs did not include provision for evaluation, assuming the remedies provided would solve the problems. "*People working in education and health fields were among the first to do systematic studies of the outcomes of their work*"[5] starting in the early 1900s. In the 1940s, private foundations began funding evaluations of innovative social programs they sponsored, such as a youth worker program to prevent delinquency in suburban neighborhoods near Boston. By the 1950s, the U.S. federal government was sponsoring new curriculum efforts with funding for evaluations of the success of the curriculums. In the mid-60s, the War on Poverty marked the beginning of large-scale government-funded evaluation—the Elementary and Secondary Education Act of 1965 included a requirement for evaluation. Robert Kennedy was the moving force behind this, seeing "*evaluation as a tool to provide parents with the necessary information.*"[6] The same period saw the rise of cost-benefit analysis in the RAND Corp, Department of Defense and elsewhere; evaluation branched out into other areas such as environmental protection, energy conservation, military recruitment, and control of immigration. In the 1970s, the inauguration of a series of social experiments to test policy and program ideas prior to enactment—using pilot programs—was a high point in evaluation history. *"By the end of the 1970s evaluation had become commonplace across federal agencies."*[7] Evaluation was a growth industry until 1981 when funding for new social initiatives was cut drastically and then made a comeback in the late 80s and early 90s.

The major shift toward more accurate measurement of program-related energy savings came about in the mid-to-late 1980s, a time of least-cost planning and large increases in utility spending on energy efficiency programs. Most analysts used definitions for cost-effectiveness tests based on the 1987 California Public Utilities Commission Standard Practice Manual of Economic Analysis of Demand-Side Management Programs; these only addressed free rider impacts; not spillover. The authors found that the most widespread approach to measuring free riders and spillover was through surveys where respondents self-report the impact of the program on their actions. Many of the early studies asked a single yes/no question to determine free ridership. By 2002, methods of inquiry were more sophisticated, with a string of questions and answers to understand partial free riders.

The methodology to assess free riders has been developing over many years, but the assessment of spillover is a more recent development. Vine in 1993 noted that free drivers (customers who install spillover measures) are more likely to be a significant problem for programs in existence for several years with high participation levels and that *"research on free drivers is limited."*[8] He suggested that there were three approaches available to enhance measurement of free drivers: (1) use a historical baseline from the early years of the program; (2) use survey methods – non-participants and trade ally interviewing; and (3) use community(ies) outside the area as a comparison group. A study done by Quantec in 2002[9] provides a snapshot of what was happening about a decade later, finding several studies on free riders but few on free drivers. The study also found there was no agreement on the best way to measure free riders and spillover and no regulatory agreement on which impacts required estimation.

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[5] Weiss, Carol H. (1998). *Evaluation 2nd Edition: Methods for Studying Programs and Policy*. Upper Saddle River, New Jersey: Prentice Hall.

[6] Weiss, p. 12.

[7] Weiss, p. 14.

[8] Vine, Ed. *The Human Dimension of Program Evaluation.* Lawrence Berkley Lab, LBL-33601, 1993.

[9] Quantec, *Assessment of Energy and Capacity Savings Potential in Iowa Volume 2: Free Riders and Spillover – A Look Back, A Path Forward*, prepared for the Iowa Utility Association, 2002.

A notable feature of recent evaluation history is the growth of activity at state and local levels, the increasing use of qualitative methods for evaluation, and the development of professional associations in evaluation. According to Weiss in 1998, "*Not too long ago the only kind of evaluation with professional legitimacy…was quantitative evaluation, preferably using randomized experimental design.*"[10] However, some evaluators relied more on words than on numbers and did not collect data through stricter interview questions or quantitative records and their books and articles provided a "*spirited exchange with supporters of quantitative methods."* Eventually, many key figures in evaluation concluded that there was room for both approaches and that they could complement each other. A common attribute of the quantitative approach is the collection of information through standardized instruments and usually include one or more comparison groups. The classical means to assess attribution is through a randomized experiment; without this ability, the evaluator uses a quasi-experimental design.[11] All of the methods discussed in this chapter, including self-report, are quantitative.

3.2 Methods to Assess Free Riders and Spillover

This section compares and critiques the key methods to assess net program impacts – self-report, econometric, and market share approaches.

Methods to estimate free ridership and spillover range from assuming a net-to-gross ratio (NTG) of 1.0 to triangulation of several methods (e.g., California's enhanced protocol). Iowa uses a NTG ratio of 1.0 based on a study done in 2002,[12] currently being updated by Summit Blue as part of a technical potential study. The new study is reviewing the literature on attribution and selected evaluation studies and found that several jurisdictions that look at both free riders and spillover are finding NTG ratios of about 1.0 (see Table 3-1)[13] and will likely recommend that "*this policy should not be changed."*

In the early days of attribution research, spillover was not often considered but over the past few years more and more jurisdictions are taking spillover into account along with free ridership. It is increasingly viewed that if programs are going to see their results discounted for free ridership that a more accurate view of net impacts can be had by adding in spillover.

[10] Weiss, p. 14.

[11] Vine, Ed. *The Human Dimension of Program Evaluation.* Lawrence Berkley Lab, LBL-33601, 1993.

[12] *Assessment of Energy and Capacity Savings Potential in Iowa Volume 2: Free Riders and Spillover – A Look Back, A Path Forward*, prepared for the Iowa Utility Association by Quantec, July 25, 2002.

[13] Personal correspondence with Gary Cullen, Summit Blue Consulting, October 2007.

Table 3-1. Selected Findings on NTG Ratios

		NTG Ratio
Residential	Efficiency Vermont[14]	1.19
	Energy Trust of Oregon[15]	1.00
Non-residential	NYSERDA (overall)[16]	1.09
	NYSERDA (CIPP)[17]	0.97
	Wisconsin Power & Light (Shared Savings)[18]	0.91

It is difficult to capture long-term market effects with an annual assessment of free ridership. A study done for Massachusetts regulators[19] noted that an annual snapshot of free-ridership and spillover measured without adequately considering the market effects associated with over a decade and a half of energy efficiency programs in Massachusetts will result in potentially biased estimates of net savings. Energy efficient technologies having high market share and few alternatives as a result of these market effects can mean energy efficiency programs now will have high free-ridership.

However, many other jurisdictions do conduct studies to assess the annual impact of free ridership and spillover using several methods. The most common methods used are described briefly below and in more detail in the rest of the section.

- **Self-Report** methods rely on responses to survey questions asking end users and/or vendors what they would have done in the absence of the program support. These methods are primarily used to determine if participating end users would have installed program measures without the program. However, these methods can also determine what additional efficiency improvements participating customers have made outside the program, how participating vendor sales practices would have been different without the program, and how nonparticipating vendor and customer practices have changed since the advent of the program.

- **Econometric Methods** consist of statistical models that compare participants' and non-participants' energy and demand patterns, their knowledge about efficiency options, and/or the trade-offs they are willing to make between efficiency options and the costs of purchasing and installing them. They

[14] *Final Report: Phase 2 Evaluation of the Efficiency Vermont Residential Programs*, prepared for the Vermont Department of Public Service, prepared by KEMA, Inc, December 2005.

[15] *2003-2004 Home Energy Savings Program Residential Impact Evaluation*, prepared for the Energy Trust of Oregon, prepared by Itron, Inc., December 2006.

[16] *New York Energy $mart Program Evaluation and Status Report for the Year Ending December 31, 2006*, New York State Energy Research and Development Authority, March 2007.

[17] *Commercial/Industrial Performance Program (CIPP) Market Characterization, Market Assessment and Causality Evaluation*, prepared for New York State Energy Research and Development Authority by Summit Blue Consulting and Quantec, April 2006.

[18] *Shared Savings Decision-Making Process Evaluation Research Results*, prepared for Wisconsin Power & Light by Summit Blue Consulting, April 11, 2006.

[19] *Standardized Methods for Free Ridership and Spillover Evaluation – Task 5 Final Report (Revised).* (PA Consulting Group Inc. 2003).

include billing analysis, econometric models, and discrete choice models and often include survey inputs as well as other non-program-related factors such as weather and rates.

- **Billing analysis** determines the effect of efficiency measures and/or a program by analysis of (usually monthly) consumption data from participating customers, often along with similar data for nonparticipating customers.
- **Other econometric models** expand on billing analysis methods to compare participants' and non-participants' energy and demand patterns, adjusting for external variables that could account for changes in use and patterns.
- **Discrete choice analysis** uses data on equipment or practice choices by participating and nonparticipating customers together with other information about customers to model choices participants would have made in the absence of the program.[20]

- **Market share methods** include the *market sales* approach which relies on aggregate data of total sales of a particular technology in a specific location, and compares this sales volume with a baseline estimate of the volume that would have been sold in the absence of the program. This method is generally used to assess transformations of markets and depends on completeness and accuracy of sales data and the validity of the baseline estimate. A similar method is *saturation data analysis* which uses observations at two points in time of the share of existing equipment stock that is high efficiency. Translating these successive observations into incremental attributable sales requires information (estimates or assumptions) about equipment turn-over rates, stocking practices, and changes that would have occurred over the time period without the program. Collecting reliable saturation data is typically expensive and not repeated frequently.

3.2.1 Econometric Methods

Billing analysis involves the use of multivariate regression models with historical utility billing data (kW and kWh) to calculate annual demand and energy savings. In general, billing analysis is used with complex equipment retrofits and controls projects and provides retrofit performance verification for projects where whole-facility baseline and post-installation data are available. Billing analysis usually involves collecting historical whole-facility baseline energy use data and a continuous measurement of the whole-facility energy use after measure installation. Energy consumption is calculated by developing statistically representative models of historical whole-facility energy consumption, and the model yields statistically adjusted engineering coefficients to modify gross engineering estimates and calculate net energy impacts.

The advantage of billing analysis is that it estimates the magnitude of net impacts rather than a fraction of total impacts attributable to the program; however, the method also has limitations. The net billing model specification incorporates both participants and nonparticipants into one model, and the resulting sample is not randomly determined. In particular, participants self-select into the program and therefore are unlikely to be randomly distributed; the unobserved characteristics that influence the decision to participate must be accounted for in the model to avoid producing biased coefficient estimates. The Inverse Mills method which includes a ratio in the model to account for self-selection was developed to

[20] Delphi methods which collect judgmental estimates from a panel of experts and develop a consensus or central range estimate are typically used only if more objective methods are not available.

correct for this bias but has several limitations: 1) large customers can exert such a significant influence that they overly bias results; 2) the usable sample is reduced by the need for good historical billing data for each customer; and 3) the method does not produce an estimate of spillover, rendering it an incomplete model of net impact[21]. Billing analysis also depends on finding a comparable non-participant population, which can be very difficult for custom projects. It also will have difficulty identifying energy savings if the expected savings are a small percentage of the total facility energy use or if other major events occur at facilities that significantly affect energy use (e.g., changes in plan schedules, adding new or closing old production lines).

Other econometric models expand on billing analysis methods to compare participants' and non-participants' energy and demand patterns, adjusting for external variables that could account for changes in use and patterns. Econometric models are used to analyze co-relational relationships, usually with the hope of determining causation. They are used to estimate macroeconomic trends and in microeconomics to estimate virtually any sort of social relationship (much as metric models, involving these same regression techniques, are used in other social sciences). The use of statistical/econometric models to estimate net impacts can avoid both the concern over the potential for bias and cognitive dissonance issues with survey research by analyzing participant and non-participant actions, characteristics and attitudes to predict free ridership and spillover. The disadvantage of this method is its inability to estimate spillover upstream in the distribution channel. A robust statistical analysis includes surveys designed to minimize self-reporting bias while collecting data on other program and participant characteristics. This level of sophistication requires a relatively large expenditure on evaluation, which can impact the cost-effectiveness of a marginal program. In California, econometric methods are preferred in situations with enough participants and comparable non-participants, and when the program is large enough to justify the expense. However, programs with either a very small number of participants or non-participants or where comparability is a severe problem are not amenable to these methods and need to rely on a survey-based method. Ed Vine of the Lawrence Berkeley Lab[22] identified the key analytical issue to assess the NTG ratio is determining an appropriate control group. Certain types of building, e.g., large industrial firms, may have unique facilities that have no comparative buildings, for example.

Another method of estimating the net-to-gross ratio is a two-stage **discrete choice model**. Discrete choice analysis uses data on equipment or practice choices by participating and nonparticipating customers together with other information about customers to model choices participants would have made in the absence of the program. This model is used to simulate the decision to purchase various types of commercial equipment. Once estimated, the model is used to determine the probability of purchasing high-efficiency equipment in the absence of the program. The probability of purchasing any given equipment option A can be expressed as the product of two probabilities—the probability that a purchase is made multiplied by the probability that equipment option A is chosen given that a purchase has been made. This method can work when the equipment examined is relatively simple in description and where choices exist in the market for different efficiency levels for that piece of equipment. Thus this can work well with prescriptive rebate programs where the types of equipment that meet and do not meet program requirements can be spelled out in detail ahead of time. Given that custom programs *by their very nature* do not follow this pattern, discrete choice models do not function well attempting to make sense of the choices involved in their necessarily more complex systems.

[21] Torok 1999.

[22] Vine, Ed. *The Human Dimension of Program Evaluation*, *Lawrence* Berkley Lab, LBL-33601, 1993

3.2.2 Self-Report Surveys

Generally, the simplest and lowest cost NTG method is using the survey-based stated intentions method with a telephone survey for data gathering. Although research has shown that this method can provide biased results, coming at the question of what the participant would have done in the absence of the program from a variety of different perspectives (directly asking, decision-making criteria, where they were in the process, etc.) and assessing these together is one way the survey methods have used to triangulate on the correct construct.[23].

The self-report approach used in the current study was based on Summit Blue's assessment of approaches taken in a variety of jurisdictions. Much of that research has been summarized in a paper by Schare and Ellefsen (2007)[24] that discusses the approach used to estimate free ridership for several New York State Energy Research and Development Authority (NYSERDA) programs The method used for NYSERDA evolved from previous NYSERDA evaluations and work done in California (described in more detail in the following section) and Massachusetts.

In 2002, Massachusetts regulators asked for a study to create a standardized free ridership survey method to be used by all Massachusetts utilities for program evaluations.[25] The objective was to develop standardized sampling techniques, data collection approaches, survey questions, survey instrument(s), and an analysis methodology that each of several sponsors[26] can use to determine free-ridership and spillover factors for C&I programs. This standardization project was designed to provide a methodology to meet the regulatory requirements to report annual program impacts (along with disaggregated free-ridership and spillover values)—an annual snapshot of the market as it currently operates.

The approach used in the current study was enhanced in subsequent studies of Wisconsin Power and Light's Shared Savings program and Arizona Public Service programs.

The method used in the current study overcomes a key limitation of self-report approaches—the difficulty of systematically converting opinions of participating customers into quantifiable free ridership values. It also provides a highly defensible approach to estimating net program impacts, which are critical inputs to benefit-cost analyses and policy decisions on the direction of energy efficiency programs.[27] The approach is based on participant self-reports and offers unique benefits of a clearly defined and repeatable method to quantify free ridership, while also incorporating qualitative information from program participants often used only as supporting illustration. The core principles of the approach include the following:

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[23] TecMarket Works, *California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals*, April 2006.

[24] Schare, S. & Ellefsen, J. *Advancing the "Science" of Free Ridership Estimation: An Evolution of the Self-Report Method for New York Energy $mart[SM] Programs, 2007.*

[25] *Standardized Methods for Free Ridership and Spillover Evaluation – Task 5 Final Report (Revised).* (PA Consulting Group Inc. 2003).

[26] National Grid (Massachusetts Electric, Nantucket Electric), NSTAR Electric, Northeast Utilities (Western Massachusetts Electric), Unitil (Fitchburg Gas & Electric Company), Cape Light Compact).

[27] Schare, S. & Ellefsen, J. Advancing the "Science" of Free Ridership Estimation: An Evolution of the Self-Report Method for New York Energy $mart[SM] Programs, 2007.

- Set the stage with the respondent by talking about the various ways the participant interacted with the program (including, for example, technical assistance, training, and financial incentives).

- Direct estimation of free ridership from the perspective that is most appropriate for the **project** and to which the respondent can best relate his program experience. This takes the form of either the likelihood that the high-efficiency measures would have been installed without the program, or the share of high-efficiency measures that would have been installed without the program.

- Separate estimation of free ridership addressing the complete project across all measure types and, alternatively, addressing decisions to install specific measures. The dual line of questioning allows respondents to provide a big-picture view of the program's influence on the project as well as to focus on specific measures, which may have been influenced by the program to varying degrees.

- Quantitative incorporation of qualitative responses based on interviewers' probing for details and causality. This aspect of the approach relies on experienced interviewers who are able to apply appropriate judgment to assign influence scores reflecting the degree to which the program affected equipment-purchasing decisions.

- Ask supporting or influencing questions that could be used to verify whether direct responses are consistent with participants' views of the program's influence.

The theory behind attribution analysis is that only impacts caused by the program should be included in net savings estimates; however, absolute proof of causality is unattainable since one can never observe what would have happened in the absence of the program. Consequently, causality "must be justified or rationalized on the basis of *a priori* argument, outside evidence, intuition, theory, or some other informal means."[28] The necessity of this approach to attribution analysis, relying in part on intuition and outside assumptions, is supported by Heckman in his argument that "there is no mechanical algorithm for producing a set of 'assumption free' facts or causal estimates based on those facts."[29]

3.2.3 Triangulation of Methods

California's new evaluation protocols for NTG impact evaluation rely heavily on self-report methods but require triangulation of methods for the enhanced level of rigor. In 2006-2007, California awarded contracts to over 70 consulting firms to perform impact evaluations of all IOU energy efficiency programs; as part of this process the CPUC supported the development of an Evaluation Framework[30] and a set of protocols[31] developed by a NTG Working Group composed of industry leaders in the evaluation field[32]. The Evaluation Framework notes that NTG can be expected to vary depending upon the maturity

[28] Moffitt, R., "*Causal Analysis in Population Research: An Economist's Perspective*," Johns Hopkins Univ., 2003.

[29] Heckman, J., "Causal Parameters and Policy Analysis in Economics: A Twentieth Century Retrospective," *The Quarterly Journal of Economics*, Volume 115, No. 2, 2000, pp. 45-97.

[30] TecMarket Works, *The California Evaluation Framework*, Southern California Edison, 2004.

[31] TecMarket Works, *California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals*, April 2006.

[32] Summary of Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approach, Self-Report_NTG_Checklist_Ridge for CA_sept 07

of the equipment or service, type of delivery in the program, maturity of the program, and customer sector. The California documents classify NTG methods as econometric (comparing participant and non-participants and adjusting for selectivity biases through econometric models) and survey-based (asking participants what they would have done).

California has three levels of rigor that can be applied to NTG analysis—basic, standard, and enhanced. Participant self-report through surveys is the required method for the basic level of rigor; for the standard level of rigor, one of three methods can be used (billing analysis, self-report, econometric or discrete choice). The enhanced level requires triangulation using more than one of the methods in the standard rigor level. The enhanced level must include analysis and justification for the method for deriving the triangulation estimate from the various methodologies used.

Guidelines were developed for using the self-report method to estimate NTG ratios; these are consistent with Summit Blue's methodology:

1) identify the correct respondent
2) use multiple questions
3) assess validity and reliability of each question
4) include consistency checks
5) make the questions measure-specific
5) include and document partial free-ridership
6) assess deferred free-ridership [This is equivalent to EGD's "advancement" approach – see the discussion under section 2.1]
7) develop scoring algorithms
8) explain handling of non-responses and "don't knows"
9) weight the NTG for size of impacts
10) report precision of the estimated NTG
11) pre-test the questionnaire
12) use multiple respondents
13) consider third-party influence.

3.2.4 When to Use Market Share or Self-Report

Market sales methods can also be used to estimate free riders and spillover. A study done for Wisconsin Focus on Energy in 2006[33] developed an approach to assist in determining whether market sales or self-report methods are appropriate for net-to-gross assessment of results for various programs. The screening criteria outlined below provide a description of the screening process used to determine which method to use. For the first two criteria, the quality of available data depends in part on the details involved in data collection which in turn depends on resources available.

[33] *Net-to-Gross Method Selection Framework for Evaluating Focus on Energy Programs*, Goldberg M.L., Bloch, O., Prahl, R., Sumi, D., Ward, B., Winch, R. and Talerico, T., March 16, 2006.

Table 3-2. Screening Criteria for Self Report versus Market Share NTG Approaches

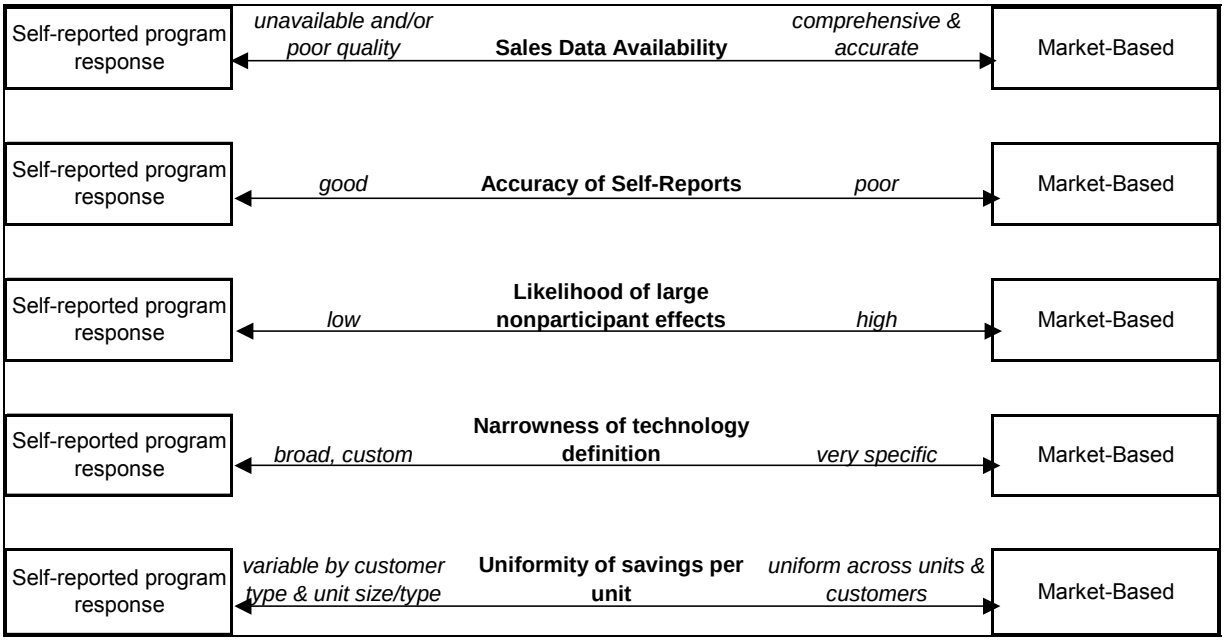
Screening Criteria	Example Screening Questions
Sales Data Availability: The availability of current and baseline market sales data enables estimating free ridership based on such data.	Are current and baseline data readily available? Are the data comprehensive and complete? Able to supplement/overcome shortcomings in data with other data collection techniques? Is the baseline estimate reliable?
Accuracy of Self-Reports: The ability of end users and vendors to report accurately what would have occurred in the absence of the program enables the use of program-response self-report methods.	Can end users/vendors accurately report what would have occurred without program? Supply-side actors can comment on programmatic versus non-programmatic influence on market? Has program altered the supply side in ways a participant would not be able to recognize?
Likelihood of Large Non-participant Market Effects: The likelihood of substantial non-participant market effects may indicate a need for applying methods for adequately capturing such effects.	Is the scale of program large relative to overall market? Are primary sales driving components (promotions, incentives) available at a consistent level throughout the year? Does the program have broad reach across market niches? Does program theory predict significant non-participant effects?
Narrowness of Technology Definition: A market data approach is suggested if the technology is a single type and well-defined, versus encompassing multiple categories, types, or wide variations.	Does program offer "custom" solutions (broad definition) or "prescriptive" measures (narrow definition)? Does program target specific technologies (narrow definition) or a broad range of technologies (broad definition)?
Uniformity of Unit Savings: The choice of method is guided by whether savings per unit is sufficiently consistent across types of units & customers to adequately quantify in terms of total units sold, or needs information on unit characteristics by customer type.	Do units promoted through the program come in widely varying size ranges/savings levels? Is an engineering estimate of necessary? Large variation in customer application of measures? Do savings per unit vary by customer application? Expect savings to vary widely by customer?

Source: Goldberg M.L. et al Net-to-Gross Method Selection Framework for Evaluating Focus on Energy Programs, March 2006.

Taken together, these factors can indicate an overall preference for one method or another. In some cases, the preference will be clear-cut. In others, the two methods may be nearly equally good—or nearly equally poor. The diagram in Figure 3-1 below indicates for each criterion what condition points toward use of market sales approaches and what condition points toward self-reported program responses.

By definition, measures implemented in custom programs do not fall into easily defined buckets for which market sales can be easily or accurately estimated. Even if discrete pieces of equipment can be identified, obtaining relevant and adequate market sales information can be very difficult.

Figure 3-1. NTG Method Selection Screening Criteria[34]



3.2.5 Overview of Pros and Cons

The survey approach is the most straightforward way to estimate free ridership and spillover and is usually the lowest cost approach. As noted by the NAP Guidelines…"survey methods can be used with any program regardless of the number of participants" whereas econometric methods "can only be used with programs with large numbers of participants because the models need large amounts of data to provide reliable results".[35] In California, econometric methods are preferred in situations with enough participants and comparable non-participants, and when the program is large enough to justify the expense. However, programs with either a very small number of participants or non-participants or where comparability is a severe problem (such as industrial plants with unique facilities) are not amenable to these methods and need to rely on a survey-based method[36]. Market share methods are generally used to assess market transformation programs or in situations where participation is not well defined.

Table 3-3 below shows an overview of the pros and cons of all of the methods discussed above.

[34] *Net-to-Gross Method Selection Framework*, ibid, Figure 1 p. 4.

[35] National Action Plan for Energy Efficiency. Model Energy Efficiency Program Impact Evaluation Guide 2007.

[36] Vine, Ed. *The Human Dimension of Program Evaluation*, *Lawrence* Berkley Lab, LBL-33601, 1993

Table 3-3. Comparison of Free Rider and Spillover Methodologies

Methodology	Pros	Cons
Billing Analysis	Quantitative estimates of magnitude of net impacts from statistically valid methods based on historical billing data.	Includes participants and non-participants in one model; sample not randomly determined due to self-selection. Could produce biased coefficient estimates if unobserved characteristics, which influence decision to participate, are not accounted for. Needs good historical data for each customer and this can reduce the number of data points. Large customers can overly bias results.[37]
Other Econometric or Discrete Choice Methods	Useful for programs that seek to transform the market. Modeling can provide more accuracy because tests for bias and precision can be included.	Econometric models need good historical data for each customer and this can reduce number of data points. Also needs data to account for variables that might be influencing the results. For discrete choice models it is difficult and costly to get accurate data on types and efficiency levels of existing equipment.[38] Neither method includes trade allies effects.
Self-Report	Simpler and less expensive than all other approaches. Can use all data points unlike billing or econometric analysis which requires historical data. Can be used in a variety of situations. Directly addresses the behaviours the program is seeking to affect. Flexible and so can take into account the complexities of program-participant interaction.	Potential for non-response bias, limited respondent recall of program influence on decision-making, and potential investigator bias in translating responses into free ridership values. Tends to underestimate spillover.
Market Share Approaches	Addresses trends in the entire market for equipment.	By definition, measures implemented in custom programs do not fall into easily defined buckets for which market sales can be easily or accurately estimated. Even if discrete pieces of equipment can be identified, obtaining relevant and adequate market sales information can be very difficult.

[37] Torok, C., Cavalli, J. and O'Drain, M. *Any Way You Slice It: Issues of Behavior and Influence in Net Impact Analysis*, 1999.

[38] Kandel, A. *Theory-Based Estimation of Energy Savings from DSM, Spillover, and Market Transformation Programs Using Survey and Billing Data.* Program Measurement and Evaluation, 2002.

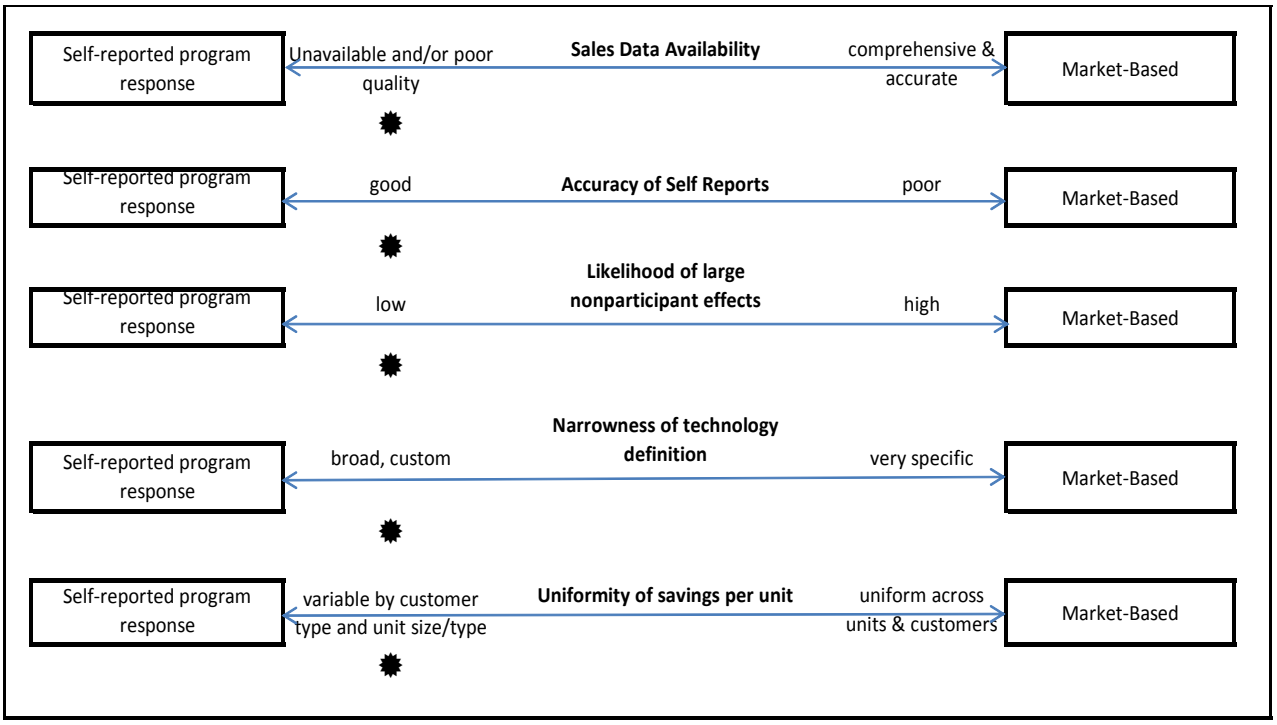
3.3 Best Method to Assess Union-Enbridge Custom Projects Free Riders and Spillover

This section applies the information discussed in the previous section about various methodologies to the Union-Enbridge research requirements to determine NTG for custom projects with large industrial and commercial customers.

It is clear that neither discrete choice models nor market share methods are appropriate methodologies for this research. Discrete choice models must focus on clear, standardized equipment choices. However, the Custom Projects measures are by definition custom and not easily placed into categories that are amenable to discrete choice analysis.

Applying the NTG method selection criteria to the custom projects program, as shown in Figure 3-2 below, clearly indicates that the self-report method is preferred over the market share approach.

Figure 3-2. Applying NTG Screening Criteria to Custom Projects



The self-report method using interviews with customers is more appropriate for this research than billing analysis or other econometric models. Table 3 compares self-report to the other two methods (combined as pros and cons are similar) based on relevant program characteristics. For example, the Custom Projects programs offered by Union Gas and Enbridge Gas Distribution are targeted specifically at large commercial and industrial customers and target complex and unique systems rather than offering prescriptive rebates. In addition, in some segments, e.g., agriculture, most eligible customers participate, making the selection of a non-participant group problematic. As shown in the table, there are problems in applying econometric methods which do not occur with self-report methods. The ideal methodology would be to apply California's Enhanced Level of Rigor which requires triangulation of estimates by at

least two methods. This approach is very costly however, and still has the problems identified in Table 3-3 for econometric models.

Table 3-4. Compare Self-Report to Econometric Methods

Program Characteristic	Self-Report Methods	Econometric Methods
Targets large customers.	In-person or telephone surveys can be used with large customers.	Large customers can overly bias results
Non-participants difficult to identify.	Does not require non-participant data for free ridership or inside spillover.	Requires both participants and non-participants in analysis.
May not detect savings at whole building/facility level.	Targets measure level information.	Energy use data generally only available at building/facility level.
External factors likely to be significant.	Survey accounts for relevant external factors.	Need to collect appropriate data to adjust for external factors.
Focused on process changes rather than equipment.	Survey accounts for changes to processes as well as equipment.	Discrete choice and other models focus on equipment choices.

Based on this assessment, Summit Blue recommends using self-report methodology as described in the Analysis Plan, which modifies the methodology developed for other jurisdictions to the specific Union-Enbridge programs.

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4 SAMPLING AND DATA COLLECTION

This section reports on the sample design and data collection process for the study.

4.1 Participant and Trade Ally Survey

The sample was drawn from customers who participated in the Custom Projects Program between the fourth quarter of 2006 and the third quarter of 2007, inclusive. (As a result, the population of participants shown below will not match numbers reported by the utilities.)

There were 594 projects in the population for EGD and 345 for Union. We completed interviews covering 233 projects. For EGD 156 or 26% of the projects were completed and for Union 77 or 22% , which is an average of 25% across both utilities (see Table 4-1). Multifamily projects represented 35% of the population and 31% of the completed interviews. Industrial projects represented 24% of the projects and 18% of the completed interviews.

Table 4-1. Participant and Trade Ally Sample Disposition

	Population			Completes			Percent of Total		
Sector	**EGD**	**Union**	**Total**	**EGD**	**Union**	**Total**	**EGD**	**Union**	**Total**
Agriculture	39	20	59	9	8	17	23%	40%	29%
Building Retrofit	114	138	252	44	21	65	39	15	26
Industrial	111	114	225	23	19	42	21	17	19
New Construction	58	13	71	24	12	36	41	92	51
Multi-Family	272	60	332	56	17	73	21	28	22
Total	594	345	939	156	77	233	26	22	25
Percent of Total									
Agriculture	7%	6%	6%	6%	10%	7%			
Building Retrofit	19%	40%	27%	28%	27%	28%			
Industrial	19%	33%	24%	15%	25%	18%			
New Construction	10%	4%	8%	15%	16%	15%			
Multi-Family	46%	17%	35%	36%	22%	31%			
Total	100%	100%	100%	100%	100%	100%			

4.2 Audit-Only Survey

The sample was taken from customers who had audits in 2005 to provide the optimal balance between providing enough time for the customers to have acted on the recommendations in the audit and ensuring that the audit is not so far in the past that respondents have trouble recalling details of the recommendations. Because the sample will be based on a single year, the result of the analysis can be expressed in spillover per year.

The audit-only spillover survey and analysis was completed for EGD only as Union Gas was unable to find any companies who had an audit in 2005 and had not implemented one of the recommended

measures through the program. As a result, the savings inspired by the Union Gas audits will appear in the program tracking data rather than in spillover. EGD provided a sample of 37 customers who had an audit but did not appear in the tracking data as having implemented a relevant measure. We attempted to complete a survey with each of those customers to estimate spillover and completed 24 surveys (including one who did not recall the audit).

4.3 Non-participant Survey

The utilities provided contact information for 1,228 non-participating customers and Global Target Marketing attempted to contact all customers for a screening interview (see Table 4-2). As expected, many respondents (32%) were screened out because they did not implement a measure since 2005. A further 10% were screened out because they were participants and 26% were screened out because they were not aware of the program. Just over one quarter (26%) had implemented a measure since 2005 and were aware of the program but the measure was not influenced by the program. Together, 94.6% of the respondents were screened out for the reasons stated above, leaving a total of 66 customers, or 5.4% of the total population, who were influenced by the program to implement measures (and did not receive a financial incentive).

These 66 customers were asked to participate in a follow up interview to help quantify savings and 38 agreed (3.1% of the total).

Table 4-2. Non-participant Spillover Screening and Engineering Survey Disposition

	Total		Union Gas				Enbridge Large Volume			
			Commercial		Industrial		Commercial		Industrial	
Screened (Total)	1,228	100.0%	1,078	100.0%	41	100.0%	72	100.0%	37	100.0%
Unaware of Energy Efficiency Program	321	26.1%	297	27.6%	3	7.3%	11	15.3%	10	27.0%
Received Financial Incentives	124	10.1%	88	8.2%	20	48.8%	14	19.4%	2	5.4%
Did Not Install/Modify Equipment Since 2005	398	32.4%	354	32.8%	8	19.5%	26	36.1%	10	27.0%
Installed Measure and Aware Of But Not Influenced By Program	319	26.0%	284	26.3%	6	14.6%	16	22.2%	13	35.1%
Installed Measure and Influenced by Program	66	5.4%	55	5.1%	4	9.8%	5	6.9%	2	5.4%
Agreed To Follow-Up	38	3.1%	33	3.1%	3	7.3%	1	1.4%	1	2.7%
Total Follow-up Interviews	27	2.2%	22	2.0%	3	7.3%	-	0.0%	1	2.7%
Total Providing Savings Estimates	5	0.4%	3	0.3%	2	4.9%	-	0.0%		0.0%

Note: The numbers in the middle rows (between the dark lines) sum to the total in the top row. The last three rows are components of the row titled "Installed Measure and Influenced by Program".

5 FINDINGS

The findings are presented in four parts, representing free ridership and three kinds of spillover, inside, outside, and audit-only. The final section combines the free ridership and spillover into one calculation to produce the final net-to-gross ratio.

5.1 Free Ridership Results

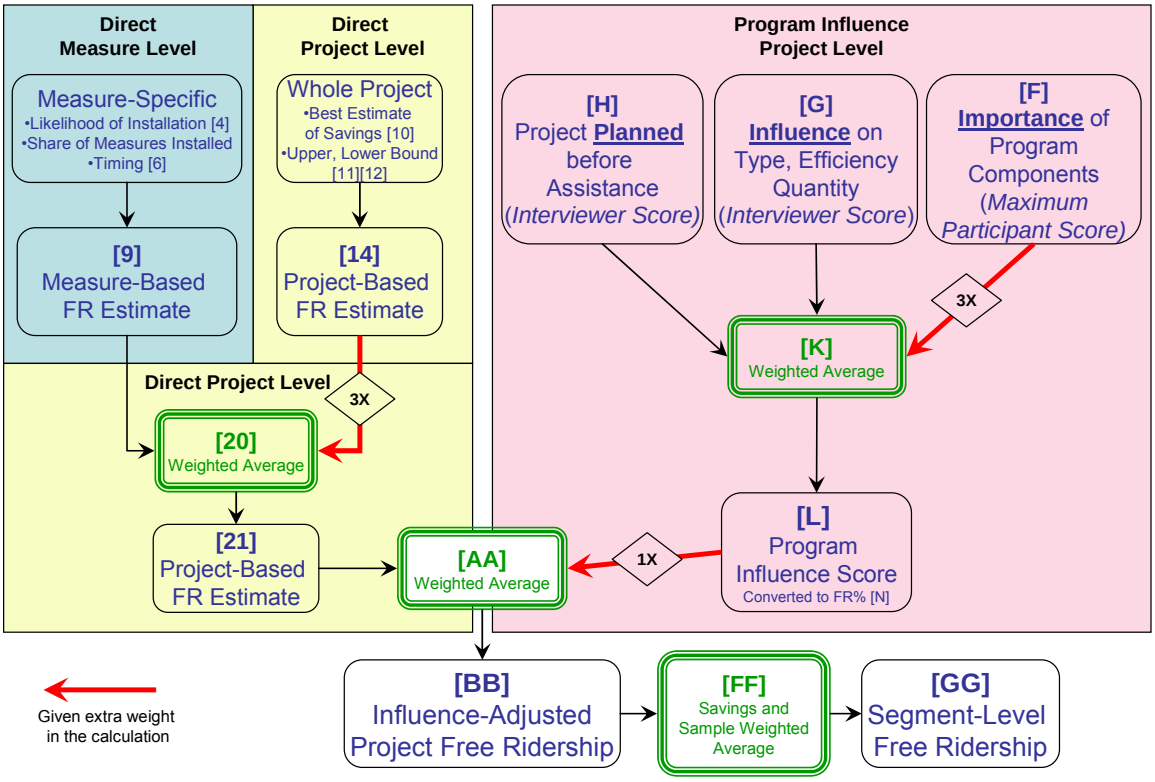
As discussed in the methodology chapter (and in the analysis plan), the calculation of free ridership requires combining answers from several different questions to come up with a single free ridership number for each measure. At several points in the calculation assumptions have to be made about how to combine answers. Should we take the maximum answer from a group of related questions? Should answers be averaged? Should some answers get more weight than others? Some calculation assumptions lend themselves to a clear decision. For example converting a 1-5 score into a free ridership percentage using a straight line conversion seems the obvious choice (where 1=0%, 3=50%, and 5=100%). Other calculation assumptions, do not present a clear answer. For example, when combining the project-based free ridership estimate with the program influence score, should they be averaged? If so, should one carry more weight than another? For those assumptions, we performed a sensitivity analysis, examined the open-ended responses and interview notes, and took into account the program approach to identify the most appropriate calculation approach. The next few paragraphs describe the recommended calculation approach. Following that are the results produced from that approach.

5.1.1 Recommended Calculation Approach

Three assumptions in the calculation had the most effect on the end result and were of the type that required a broad analysis of the program and survey data to suggest the appropriate calculation approach. Those three are shown at [20], [K], and [AA] in the calculation overview diagram in Figure 5-1. After examining all available evidence, we conclude that the most appropriate approach is to give the weights shown in the diamond shapes in those calculations. First, giving triple weight to [14] in the calculation at [20] is appropriate for the following reasons:

- The calculation at [20] averages direct measure level questions [9] and direct project level questions [14]. The direct measure level questions expect the respondent to think discretely about separate components of the project decision. The direct project level question [10] asks them to think about the project as a whole, and considering all program involvement. Given that the utility interacts with the customer over a long period of time, in a variety of ways, and that the measures are typically complex with many factors influencing the decision, it seems less likely that the respondent will be able to successfully think about a component of the decision than about the decision taken as a whole. As a result, the answer to the direct project level question [10] is probably more believable than the measure-based estimate [9]. Because of that conclusion, we weight the project-based estimate more heavily than the measure-based estimate in [20] by a factor of 3.

Figure 5-1. Final Calculation Overview



Second, giving triple weight to [F] in the calculation at [K] is appropriate for the following reasons:

- Point [H] in this calculation is an interviewer score of the amount of planning that went on for the measure before the program got involved. There are several potential weaknesses in the answers to this question that argue for reducing its weight in the calculation at [K]:
  - Program staff were frequently providing assistance to the participants over a long period of time. By the time the measure was installed (and we called on the participant for an interview), respondents may have forgotten the history of the project planning. Those involved in the initial planning may no longer be at the company or in a position to pass along the history of the planning to those ultimately interviewed.
  - Because the program projects are often complex and related to equipment central to a company's output, the fact that plans were in place prior to program involvement does not necessarily imply that the program had no influence. For example, the decision to modify a production line may be driven by changes in the market for their product. Thus plans might be in place to change equipment prior to program involvement but the program involvement could still affect the efficiency of the equipment chosen.
  - Because the program projects are often complex, planning takes place over a long period of time and proceeds through several steps. The program could get involved after initial planning took place – e.g., the decision was made to modify a production line – but before the specifications were written for the equipment affected by the program. Assessing the program's influence on planning in such a circumstance can be difficult to apply in a standard and uniform fashion across projects.

- Point [G] in the calculation at [K] is an interviewer score of the program's influence on the type, efficiency and quantity of the equipment installed. The driving question at [G] was as follows: "Did the assistance you received from [Enbridge/Union] in any way influence your capital funding acquisition process, the type or efficiency level of the equipment or the amount of high efficiency equipment you installed or process changes implemented?" Many of the projects implemented under this program were implemented primarily to address issues other than energy costs. In many cases, the program's hoped-for impact was to increase the energy efficiency of the project rather than inspire the change in the first place. As a result, factors other than energy are often driving decisions about capital funding and the type and quantity of equipment installed and it is unlikely that the program will have much if any affect on those factors. The question at hand was designed to measure the program's influence on those factors in addition to the efficiency of the equipment. This has the effect of diluting the impact of the efficiency issue in the final interviewer score. These weaknesses in this question argue for reducing its weight in the calculation at [K].

- Point [F] represents several questions on the importance of several program components or types of assistance in the participant's decision to install energy efficiency equipment. The questions in [H] and [G] ask the respondent to think about <u>all</u> program assistance as a bundle while focusing on a specific aspect of the decision process. The questions in [F], on the other hand, ask the respondent to think about individual components of program assistance while focusing on the whole decision process. As discussed above, given that the measures are typically complex with many factors influencing the decision, it seems less likely that the respondent will be able to successfully think about a component of the decision (as in [H] and [G]) than about the decision taken as a whole (as in [F]). The [F] series of questions brings in the specific components of the program assistance and, particularly given the drawbacks with [H] and [G], seems more likely to give a more accurate picture of the program's influence.

Finally, giving equal weight to [21] and [L] in the calculation at [AA] is appropriate for the following reasons:

- The conclusions drawn above on [20] and [K] give more weight to questions that address the whole project rather than specific components. They provide two different approaches for the respondent to address the program's influence: estimating savings that would have happened in the absence of the program in [14], and the how important program components were in the decision to install energy efficiency equipment in [F]. Addressing the same general issue from two different perspectives ought to provide a more robust estimate of the true impact.

- Given that the questions at [14] and [F] have already had their weight in the calculation increased, giving more weight to one or the other of these components in the calculation at [AA] would have the effect of ensuring that the final result is largely driven by the answer to one question (or one type of question in the case of [F]). This places too much importance on a single question and is contrary to the philosophy of the general approach which is of triangulating at the answer from a variety of perspectives.

5.1.2 Results

Using the calculation approach defined above produces a total free ridership rate across both utilities and all sectors of 48% as shown in Table 5-1. The free ridership rate for EGD is 41% and it is 54% for Union Gas. Free ridership rates of near 50% are not uncommon in custom programs throughout North America. In a 2006 study Summit Blue performed for Alliant Energy, we found five programs out of 21 with free ridership rates above 40%.[39] Summit Blue recommends that the utilities use the utility-specific total free ridership values of 41% and 54% as the best estimate of free ridership. Those results are based on larger sample sizes than the sector-specific results and proved more stable in the sensitivity analysis. The sector-specific results are based on smaller sample sizes and should only be used to support program management, for example to support targeting and marketing decisions.

Table 5-1. Free Ridership Results

Sector	EGD	Union	Total
Agriculture	40%	0%	18%
Commercial Retrofit	12%	59%	27%
Industrial	50%	56%	53%
Multifamily	20%	42%	26%
New Construction	26%	33%	28%
Total	41%	54%	48%

Assumptions (See Figure 2.1 for the interpretation of these assumptions):

Weight of Participant Reported Importance [F] in [K] compared to the planning [H] and influence [G] scores	Triple weight
Weight of Project-based estimate [14] in [20] compared to the measure-specific scores [9]	Triple Weight
Weight of Program Influence Score [L] compared to the Project-Based score [21]	Equal Weight

5.1.3 Bin Analysis

As discussed above, there are several potential weaknesses in the answers to some of the questions asked of participants. Given that the utility is often involved well in advance of project implementation, it is possible that in the intervening time the institutional memory of the history of the utility's program involvement has been lost. It is also possible that the participant has taken ownership of the information or approach that originally came with support from the utility and now views it as their own, not something brought to them by the utility. Now of course without defining away the possibility of free ridership even existing, we cannot say that prior utility program involvement prior to project implementation is evidence that free ridership does not exist. However, there is one area that is more concrete than simple "prior program involvement" that is worth examining. In some cases, the utilities supported energy audits that looked for and provided support to decisions to implement specific energy efficiency measures. It seems reasonable to conclude that at least in some cases those audits inspired the subsequent installation or modification. It also seems possible that if the audit were some time before implementation, the respondents we talked to may not have been aware of the influence of the audit.

[39] Shared Savings Decision-Making Process Evaluation Research Results. Jeff Erickson, Summit Blue Consulting for Wisconsin Power & Light (Alliant). August 11, 2006.

To examine the possible implications of this issue, we performed a bin analysis. We received from the utilities dates of energy audits or studies done in advance of specific measures that were addressed in our participant interviews. The free ridership savings were placed in two bins based on historical data provided by the utilities. Projects that met any of the following criteria were placed in a "Preceding Audit" bin:

- A utility-sponsored audit or feasibility study preceded the measure implementation and was directly related to the measure installed.
- The same measure had been installed through the program in a previous program year.
- EGD paid part or all of the salary for an on-site energy manager at the facility prior to the measure implementation.

All other projects were placed in a "No Preceding Audit" bin. In this way, on a measure-by-measure basis, we put the m^3 savings that had been defined as free ridership into one of two bins. The results are shown in the following table. As in the previous table, the total free ridership across both utilities is 48% (the bottom right cell in the table). Splitting this into two pieces shows that the total free ridership is made of 25% from projects that had preceding audits and 23% that did not. (Note that 25%+23%=48%, the total free ridership percentage.) The "Preceding Audit" values represent just over half of the total free ridership for the two utilities combined and represent well over half of Union's free ridership.

Table 5-2. Free Ridership Split Based on Preceding Audit

	Preceding Audit			No Preceding Audit			Total		
Sector	**EGD**	**Union**	**Total**	**EGD**	**Union**	**Total**	**EGD**	**Union**	**Total**
Agriculture	6%	0%	3%	34%	0%	15%	40%	0%	18%
Commercial Retrofit	0%	7%	2%	12%	52%	25%	12%	59%	27%
Industrial	12%	44%	31%	38%	12%	22%	50%	56%	53%
Multifamily	0%	0%	0%	20%	42%	26%	20%	42%	26%
New Construction	0%	6%	2%	26%	27%	26%	26%	33%	28%
Total	8%	38%	25%	33%	16%	23%	41%	54%	48%

One possible interpretation of the "Preceding Audit" free ridership values is that they are spillover caused by the audit and the "No Preceding Audit" values are pure free ridership. If the audit altered the participant behavior and/or plans, but the respondent either was not aware of that change or had forgotten about the program's earlier influence, then the "Preceding Audit" values would accurately be described as spillover. If, on the other hand, the earlier measure implementations were also free riders and the audit truly did not significantly affect the decision-making process, then the "Preceding Audit" values would not be spillover.

The preparation for the surveys, the surveys themselves, and the survey process were designed to get to respondents with knowledge of the history of the project and remind participants of their company's past involvement in the program. Given the high free ridership rates, it seemed appropriate to do some additional research in this area. We called back three of the largest participants who had prior audits to verify whether they were aware of the audits and to gauge the impact of the audits on their planning and decision process. In two of the three cases, we judged that our original free ridership estimate was accurate and that the prior audits were not driving factors in the decision. In the third case we adjusted responses from the earlier interview to reflect the new information we received in the follow-up call.

5.1.4 What is Driving the Results?

This section examines various factors that may help explain where the most significant issues with free ridership are.

Sector

Industrial gross m^3 savings represent 84% of the total program savings (Table 5-3) and therefore drive the final results. The Industrial sector accounts for 77% of EGD's gross savings and 89% of Union's.

Table 5-3. Gross m^3 Savings as Percent of Total by Sector

Sector	EGD	Union	Total
Agriculture	3%	3%	3%
Industrial	77%	89%	84%
Multifamily	8%	1%	4%
New Construction	2%	1%	1%
Commercial Retrofit	10%	6%	7%
Total	100%	100%	100%

The EGD Industrial free ridership rate is 50% and Union's is 56% (see Table 5-4, which is identical to Table 5-1). The other EGD sectors have relatively low free ridership rates, with the exception of Agriculture, which is only 3% of the total savings. The other Union sectors (with the exception of agriculture) have fairly high free ridership rates, which explains why the total Union free ridership rate is higher than EGD's, given that their Industrial rates are close.

Table 5-4. Free Ridership Results

Sector	EGD	Union	Total
Agriculture	40%	0%	18%
Commercial Retrofit	12%	59%	27%
Industrial	50%	56%	53%
Multifamily	20%	42%	26%
New Construction	26%	33%	28%
Total	41%	54%	48%

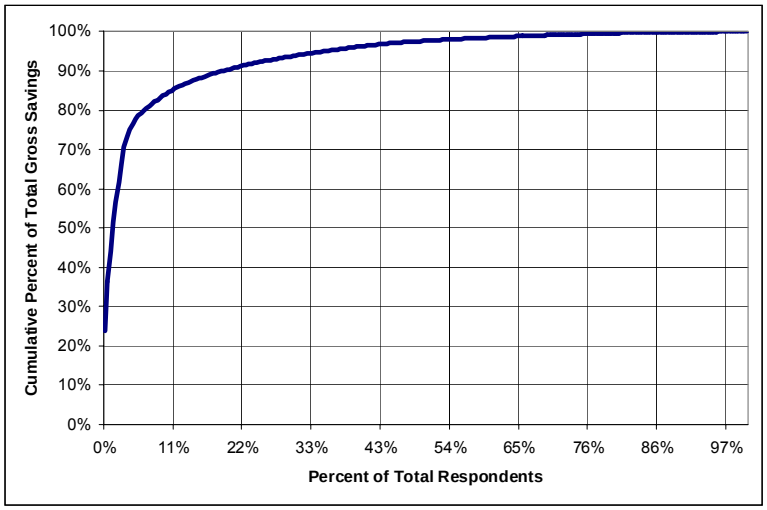
Assumptions (See Figure 2.1 for the interpretation of these assumptions):

Weight of Participant Reported Importance [F] in [K] compared to the planning [H] and influence [G] scores	Triple weight
Weight of Project-based estimate [14] in [20] compared to the measure-specific scores [9]	Triple Weight
Weight of Program Influence Score [L] compared to the Project-Based score [21]	Equal Weight

Company Size

Program gross m^3 savings are concentrated in a relatively small number of participants. The top 10% of respondents based on gross m^3 savings consume 84% of total program savings (among those interviewed) (Figure 5-2). The 15 companies with the most m^3 savings together save 80% of total gross m^3 savings. The free ridership rate for those 15 companies is 56% across both utilities. If we eliminate those 15 companies, the free ridership rate drops to 34%.

Figure 5-2. Cumulative Percent of Gross Savings



Measure Type

Machine/Process measures account for 44% of the gross savings and HVAC measures account for 39%; together they drive the final results. The Machine/Process free ridership rate is 56% and HVAC is 46%. Lighting and "Other" measures have fairly high free ridership rates and Hot Water, Envelope, and Controls have fairly low rates.

Table 5-5. Free Ridership By Measure Type

Measure Type	Free Ridership Rate
Machine/Process	56%
HVAC	46%
Lighting	43%
Other	37%
Agriculture	29%
Envelope	22%
Hot Water	15%
Controls	13%

Assumptions (See Figure 2.1 for the interpretation of these assumptions):

Weight of Participant Reported Importance [F] in [K] compared to the planning [H] and influence [G] scores	Triple weight
Weight of Project-based estimate [14] in [20] compared to the measure-specific scores [9]	Triple Weight
Weight of Program Influence Score [L] compared to the Project-Based score [21]	Equal Weight

Other Observations

There are several factors that influence the free ridership results, which can be loosely categorized into factors that increase free ridership, those that decrease free ridership, and those that reflect well on the program but that do not improve the free ridership value.

Factors that increase free ridership

- In many energy efficiency programs for large, complex projects the utility incentive will typically not be particularly large compared to the overall project cost. As a result, the respondents may feel that it

has relatively little impact on the direction of their project. (On the other hand, the existence of an incentive can raise the level of interest and still have an effect even if the incentive is not large.)

- Regardless of the size of the incentive, it can only have an impact on decision making if the potential recipient feels the chances of receiving the incentive are reasonably high. Because custom projects can involve multiple vendors any confusion about who will receive the incentive will reduce its overall impact on the decision process.

- Design Engineers and Energy Performance Contractors see themselves as sophisticated energy users, and pride themselves on being knowledgeable and competent on energy efficiency issues and in providing the most energy efficient solutions to their clients. This may imply that approaches that aim to influence these channels are not as effective in changing existing energy efficiency choices.

- Again because custom projects can involve multiple vendors, some vendors may be insulated from the key decision makers by other vendors. As a result, any program activities targeting these vendors may fail to influence the final decisions.

- Large industrial end-users often have the accounting mechanisms in place to understand the effects of energy use on their bottom line, they require highly specialized technologies for their application, and they have the in-house expertise to identify and evaluate efficient options for those specialized technologies. In addition, there may be a number of very competent consultants and suppliers who assist the industry with energy efficiency and in a number of other technical support areas. For this kind of company, assistance provided by utility programs must stand out in some particular way to be noticed. The subtleties of that assistance may be lost as time goes on and as staff change, making it harder to identify the effects of that assistance when looking back over time.

Factors that decrease free ridership

- The Utility provides an independent third party verification of the predicted savings and this is very valuable in the decision making process in many organizations.

Positive stories, but ones that do not improve the free ridership

- The participants are quite pleased with their involvement with the program, glad to get the Utility's assistance, and satisfied with the program.

- The Program assistance and incentives help grease the skids, but they do not change the direction or destination of the sled.

- One trade ally reported "The program gives a comfort factor on value of energy efficiency measures. It improves the interaction between the utility and the customer."

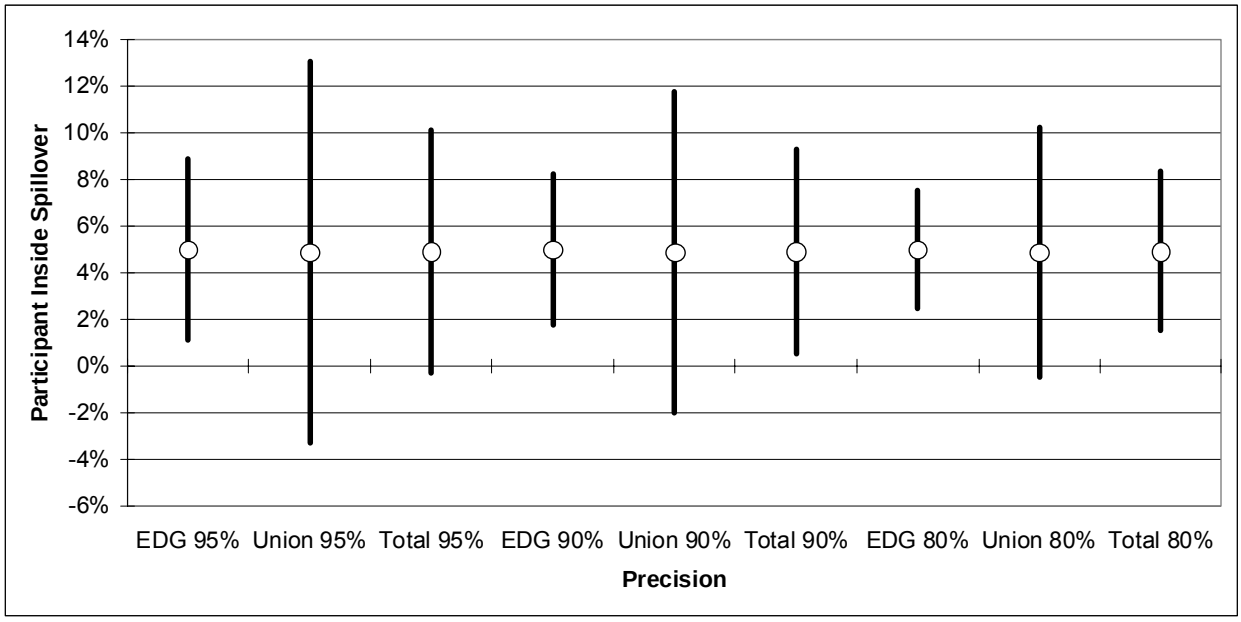
5.2 Spillover Results

Spillover represents energy savings that are due to the program but not counted in program records. Summit Blue estimated **participant inside and outside spillover** through questions in the participant and trade ally surveys and through the Audit-Only Survey. Summit Blue estimated non-participant spillover through the non-participant survey.

5.2.1 Participant Inside Spillover Results

Nine respondents for EGD and five for Union indicated that they had installed additional energy efficiency measures at the same facility without going through the program, those measures count as inside spillover. By extrapolating the m^3 savings from those measures to the population, we calculate that **inside spillover was 5% of gross reported savings for both EGD and Union**. The results for EDG are statistically significant at the 95% level. However, the results for Union are not statistically significant, even at the 80% level. The following figure shows the error bounds around the mean estimate. When the error bounds crosses zero, we cannot say with statistical precision that the results are not zero. The EDG-Union combined total is statistically significant at 90%. Given that the spillover numbers are based on a rather small number of respondents, it is appropriate to calculate spillover across the entire pool of respondents, for Union and EGD combined.

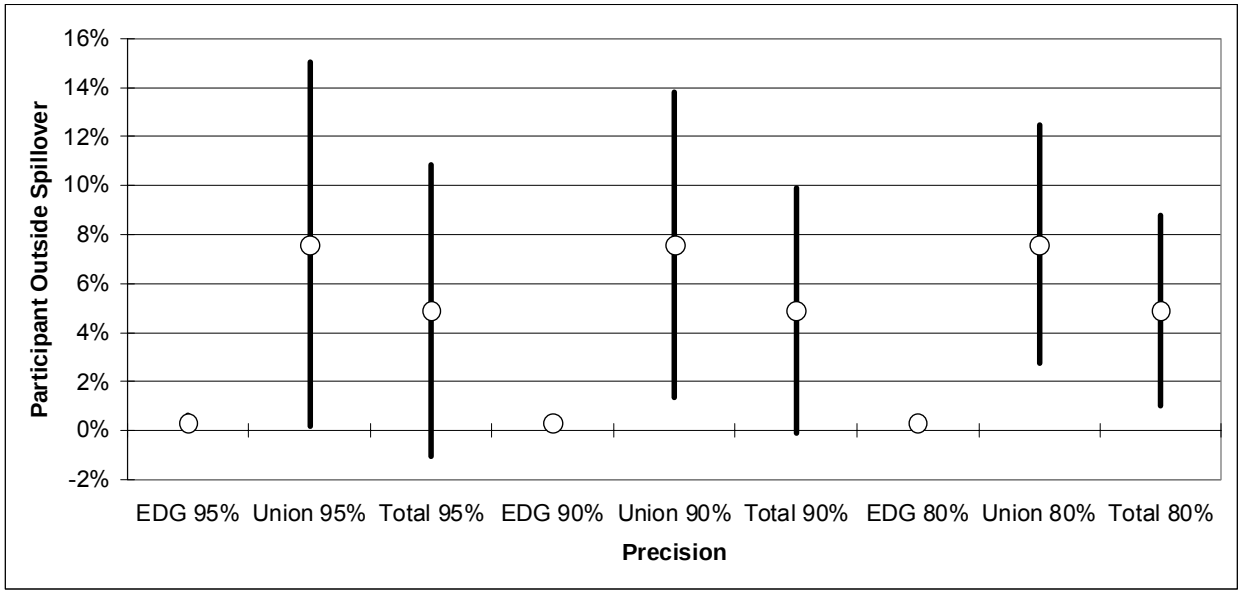
Figure 5-3. Participant Inside Spillover



5.2.2 Participant Outside Spillover Results

Four respondents for EGD and three for Union indicated that they had installed additional energy efficiency measures at *different* facilities without going through the program. Those measures count as outside spillover. By extrapolating the m^3 savings from those measures to the population, we calculate that **outside spillover for Union was 7.6% of gross reported savings, less than 1/2 percent for EGD, and 5% combined across both utilities.** The following figure shows the error bounds around the mean estimate. Given that the spillover numbers are based on a rather small number of respondents, it is appropriate to calculate spillover across the entire pool of respondents, for Union and EGD combined, which is statistically significant at the 80% confidence level.

Figure 5-4. Participant Outside Spillover



5.2.3 Participant Audit-Only Spillover Results

Customers who received an audit, implemented a recommended measure, but did not receive incentives through the program for that measure can be considered audit-only spillover. The audit-only spillover survey and analysis was completed for EGD only as Union Gas was unable to find any companies who had an audit in 2005 and had not implemented one of the recommended measures through the program. As a result, the savings inspired by the Union Gas audits will appear in the program tracking data rather than in spillover. EGD provided a sample of 37 customers who had an audit but did not appear in the tracking data as having implemented a relevant measure. We attempted to complete a survey with each of those customers to estimate spillover and completed 24 surveys (including one who did not recall the audit).

For each respondent, we calculated the share of the recommended measure savings that could be attributed to the influence of the program. 43% of the m^3 savings estimated in the audit were achieved by those who completed a survey. We then applied the 43% savings to parts of the population that can be assumed to follow the same pattern as the respondents (non-respondents and refusals) and assumed zero savings for those who did not recall the audit or whose business was sold or closed (one company was sold, 3 were closed). Summing spillover savings over the whole group then dividing by the sum of the recommended savings gives the final realization rate for spillover savings for the population, which was 35%. **Thus 35% of the gross recommended savings from energy audits are achieved, representing the audit-only spillover.** The total audit-only spillover savings (1,969,700 m^3) will be brought into the final calculation of the program's net-to-gross ratio.

Since the sample was a census of the eligible population there is no need to extrapolate beyond the calculation explained above.

5.2.4 Non-participant Spillover Results

Screening Survey Results. The utilities provided contact information for 1,228 non-participating customers and Global Target Marketing attempted to contact all customers for a screening interview (see Table 5-6). As expected, many respondents (32%) were screened out because they did not implement a measure since 2005. A further 10% were screened out because they were participants and 26% were screened out because they were not aware of the program. Just over one quarter (26%) had implemented a measure since 2005 and were aware of the program but the measure was not influenced by the program. Together, 94.6% of the respondents were screened out for the reasons stated above, leaving a total of 66 customers, or **5.4% of the total population, who were influenced by the program to implement measures** (and did not receive a financial incentive).

These 66 customers were asked to participate in a follow up interview to help quantify savings and 38 agreed (3.1% of the total). Three engineers attempted to contact all 38 customers and conducted interviews with 27 customers (2.2% of the total population and a 71% response rate). Of these, only 5 Union Gas customers (3 commercial and 2 industrial, representing 0.4% of the population) were able to provide enough information to the engineers to enable them to quantify savings. The engineers rated their confidence in the accuracy of their spillover estimates for each project, given the information the respondent was able to provide and the assumptions that they had to make given shortfalls in the data. None of the engineers felt more than modestly confident that the estimates were accurate and several estimates were rated "weak".

Conclusion. Because of the large size of the sample submitted to the screening effort, the fact that **5.4% of the population had spillover measures** is a meaningful and important result. However, given that we were able to estimate m^3 savings for only 5 respondents, which was less than 10% of those with spillover, and that our engineers were not very confident in the accuracy of the savings calculations, we cannot extrapolate m^3 spillover savings to the population.

Our engineers reported that most respondents could not provide useful information about the equipment installed. As a result, any effort to improve on this effort should include on-site visits by evaluation engineers so that they can directly observe the equipment and collect the data they need to make the savings estimates. This will increase the accuracy of the site-specific savings estimates and will likely increase the number of sites for which estimates can be calculated.

Table 5-6. Non-participant Spillover Screening and Engineering Survey Disposition

	Total		Union Gas				Enbridge Large Volume			
			Commercial		Industrial		Commercial		Industrial	
Screened (Total)	1,228	100.0%	1,078	100.0%	41	100.0%	72	100.0%	37	100.0%
Unaware of Energy Efficiency Program	321	26.1%	297	27.6%	3	7.3%	11	15.3%	10	27.0%
Received Financial Incentives	124	10.1%	88	8.2%	20	48.8%	14	19.4%	2	5.4%
Did Not Install/Modify Equipment Since 2005	398	32.4%	354	32.8%	8	19.5%	26	36.1%	10	27.0%
Installed Measure and Aware Of But Not Influenced By Program	319	26.0%	284	26.3%	6	14.6%	16	22.2%	13	35.1%
Installed Measure and Influenced by Program	66	5.4%	55	5.1%	4	9.8%	5	6.9%	2	5.4%
Agreed To Follow-Up	38	3.1%	33	3.1%	3	7.3%	1	1.4%	1	2.7%
Total Follow-up Interviews	27	2.2%	22	2.0%	3	7.3%	-	0.0%	1	2.7%
Total Providing Savings Estimates	5	0.4%	3	0.3%	2	4.9%	-	0.0%		0.0%

5.2.5 Recommended Spillover Rates

Summit Blue recommends the utilities use following spillover rates:

Table 5-7. Spillover Results

Spillover Type	EGD	Union	Base
Participant Inside Spillover	5%	5%	Of gross reported savings
Participant Outside Spillover	5%	5%	Of gross reported savings
Audit-Only Spillover	35%	0%	Of gross audit-recommended savings
Nonparticipant Spillover	0%	0%	

5.3 Net-to-Gross Ratio

The net-to-gross ratio is defined as 1 - free ridership ratio + spillover ratio. As discussed above, spillover is in several parts: participant inside and outside spillover, audit-only spillover, and non-participant spillover. We know that 5.4% of the non-participants have spillover but cannot calculate its quantity so the calculation of net-to-gross presented below excludes it. Together participant inside and outside spillover amount to 10%. The audit-only savings were 1,969,700 m^3 for EGD, which represents 11% of EGD total gross savings (see Table 5-8). With zero Union audit-only savings, the total audit-only savings equals the EGD savings and the combined audit-only spillover rate is 5%. Subtracting free ridership and adding spillover produces a final **net-to-gross ratio of 79% for EGD, 56% for Union, and 67% across both utilities.** Summit Blue recommends that the utilities use the utility-specific total net-to-gross ratios, as they are based on larger sample sizes than the sector-specific results.

Table 5-8. Net-To-Gross Ratio

Utility	Sector	Gross m^3 Savings	Free Ridership	Participant Inside + Outside Spillover	Audit-Only m^3 Savings	Audit-Only Spillover %	Net-to-Gross Ratio
EGD	Agriculture	1,111,398	40%				
EGD	Commercial Retrofit	3,052,840	12%				
EGD	Industrial	10,028,771	50%				
EGD	Multifamily	1,575,482	20%				
EGD	New Construction	798,310	26%				
EGD	Total	18,588,008	41%	10%	1,969,700	11%	79%
Union	Agriculture	1,387,850	0%				
Union	Commercial Retrofit	1,406,897	59%				
Union	Industrial	14,874,847	56%				
Union	Multifamily	520,974	42%				
Union	New Construction	304,991	33%				
Union	Total	23,209,837	54%	10%	0	0%	56%
Total	Agriculture	2,499,248	18%				
Total	Commercial Retrofit	4,459,738	27%				
Total	Industrial	24,903,618	53%				
Total	Multifamily	2,096,456	26%				
Total	New Construction	1,103,302	28%				
Total	Total	41,797,844	48%	10%	1,969,700	5%	67%

Free Ridership Assumptions (See Figure 2.1 for the interpretation of these assumptions):

Weight of Participant Reported Importance [F] in [K] compared to the planning [H] and influence [G] scores	Triple weight
Weight of Project-based estimate [14] in [20] compared to the measure-specific scores [9]	Triple Weight
Weight of Program Influence Score [L] compared to the Project-Based score [21]	Equal Weight

6 SUPPLEMENTARY RESULTS

The participant surveys included several questions that illuminate the customer's decision-making process, but do not necessarily feed directly into the free ridership calculation. This section will present some of those results, first for end users, next for trade allies, and then at the sector level. Following that will be a brief summary of free ridership, spillover, and net-to-gross results from other jurisdictions.

6.1 End Users

Most (35 out of 40 or 88%) EGD end user respondents have a policy that specifies energy efficiency requirements. 18 target specific energy efficiency levels.

For Union 12 out of 24 (50%) have a policy that specifies energy efficiency requirements (4 target energy efficiency levels).

Table 6-1. Company Has an Energy efficiency Policy

	Missing	Yes	No	Total
EGD	1	35	3	39
Union	0	12	12	24
Total	1	47	15	63

Those who had a policy were asked about the efficiency level stated in the policy. The results are shown in the following table.

Table 6-2. Efficiency Level Stated in the Policy

Efficiency Level Stated in the Policy	EGD	Union	Total
Missing	22	8	30
1	0	1	1
20	1	0	1
35	0	1	1
5 % reduction in energy cost per vehicle	2	0	2
8	1	0	1
80+	0	1	1
84 % efficiency on boilers	4	0	4
86 % for boilers	1	0	1
86 % for boilers; new school perspective specifies nature of any equipment	1	0	1
Better than code but no specific amount set.	2	0	2
Exceed National Building code by 25 % on new buildings	1	0	1
reduce fossil fuels by 15% per year, starting in 2002	0	1	1
Total	35	12	47

Virtually all respondents had criteria for energy efficient equipment.

Table 6-3. Do You Have Criteria For Energy Efficient Equipment?

	Yes	No	Total
EGD	39	0	39
Union	23	1	24
Total	62	1	63

The criteria for approving energy efficiency equipment is predominantly simple payback period (multiple respondents mentioned this). 95% of EGD respondents mentioned payback, 17% life cycle cost analysis, 14% internal rate of return (IRR).

78% of Union respondents mentioned payback, 22% mentioned IRR, 9% mentioned life cycle cost analysis.

Only 7 respondents (3 EGD, 4 Union) changed their energy efficiency policy since the project. The table below shows the changes they made.

Table 6-4. How has your energy efficiency policy changed since the project?

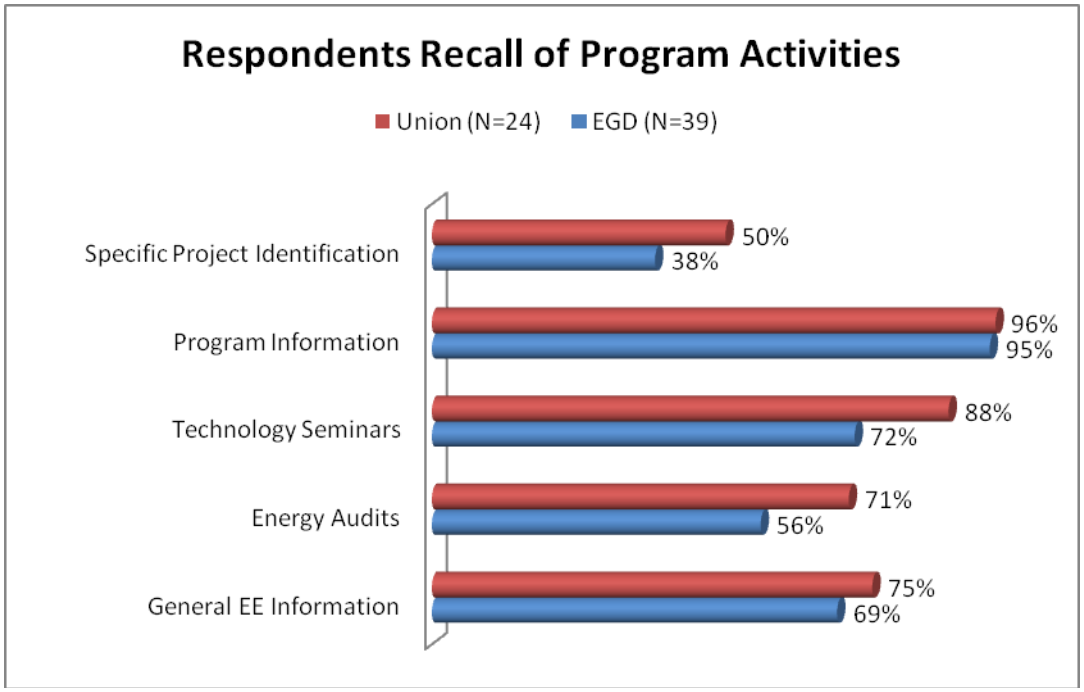
	EGD	Union	Total
EE is now part of their business plan, with a target reduction of 5% annually	0	1	1
Energy wise program has raised awareness of energy efficiency	0	1	1
Greater awareness of need to maintain energy efficiency	0	1	1
Payback has been extended to 5 years	1	0	1
Since the project, the end user has developed a corporate energy policy with a target of a 20% reduction by 2020	0	1	1
Total energy reduction of 6 %	2	0	2
Total	3	4	7

Table 6-5. Percent of respondents recalling program initiative by utility

	General energy efficiency Information	Energy Audits	Technology Seminars	Program Information	Specific Project Identification
EGD (N=39)	69%	56%	72%	95%	38%
Union (N=24)	75%	71%	88%	96%	50%
Total (N=63)	71%	62%	78%	95%	43%

Respondents were asked whether they recalled participating in various program activities. Almost all recalled getting program information (Figure 6-1). Approximately three-fourths remembered going to technology seminars and getting general energy efficiency information.

Figure 6-1. Respondents' Recall of Program Activities



Respondents were asked what the payback was for their project after figuring in the utility incentive. For EGD, 18 of 39 did not respond and 6 had paybacks under a year after incentive (Table 6-6 and Figure 6-2). For Union Gas, 19 of 24 did not respond. Of the 5 who responded, 1 had a payback period under a year.

Table 6-6. What was the project's payback after figuring in the utility incentive?

	EGD	Union	Total
Missing	18	19	37
LT 1 YR	6	1	1
1 to 3 Years	6	3	1
4 to 11 years	9	1	1
Total	39	24	63

6.2 Trade Allies

Consulting Engineers were the most common type of trade ally among the respondents followed by installation contractors (Table 6-7, Figure 6-2, and Figure 6-3). Among our respondents, Enbridge had no manufacturer or distributor/sales as business partners and Union had no property managers as allies.

Table 6-7. Primary Line of Business

	EGD	Union	Total
Consulting Engineer	17	21	38
Installation Contractor	8	6	14
ESCO	5	7	12
Manufacturer	0	8	8
Distributor or Equipment Sales	0	5	5
Property Manager	3	0	3
Other	2	0	2
Total	35	47	82

Figure 6-2. Types of Trade Allies

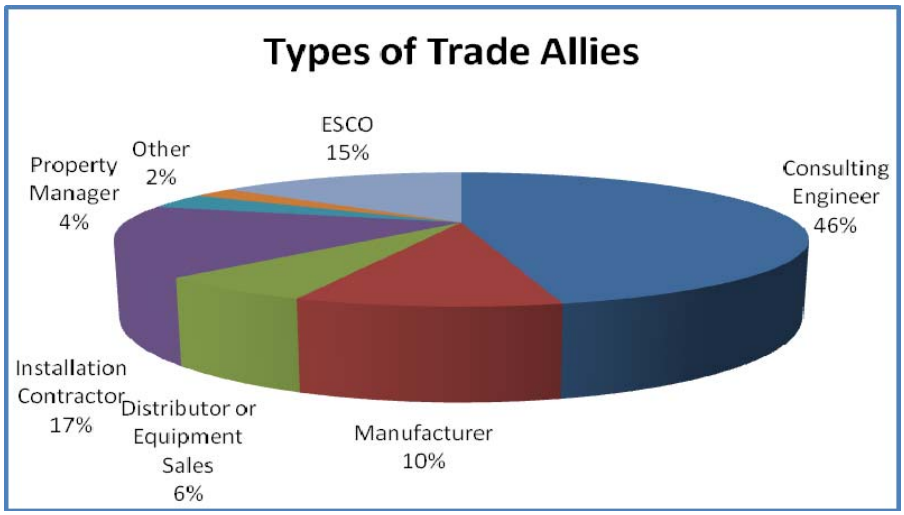
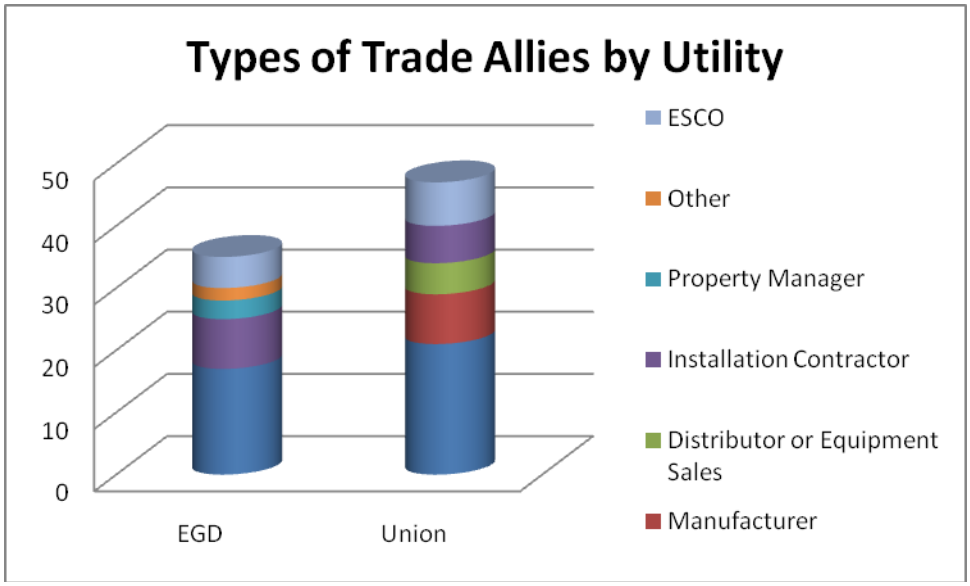
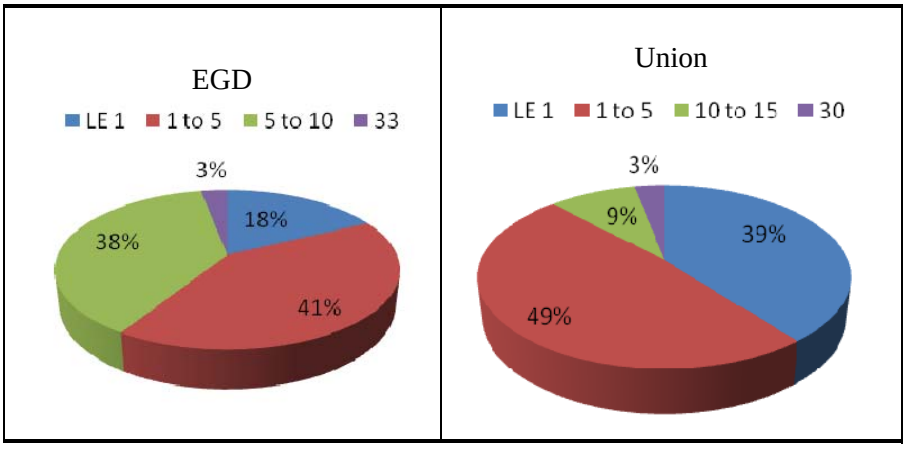


Figure 6-3. Types of Trade Allies by Utility



Respondents were asked to quantify the program incentives as a percent of total project costs. The most common answer was 1-5%, named by just under half of the respondents (Figure 6-4). Over one third of trade allies associated with Union Gas projects thought the incentives were less than or equal to 1%, compared to 18% of the EGD respondents.

Figure 6-4. Incentives as a % of Project Costs



According to the trade allies, all of Enbridge customers were aware of the utility role in the project but only 2/3 of the Union customers were aware.

Table 6-8. Customer Aware Of Utility Role

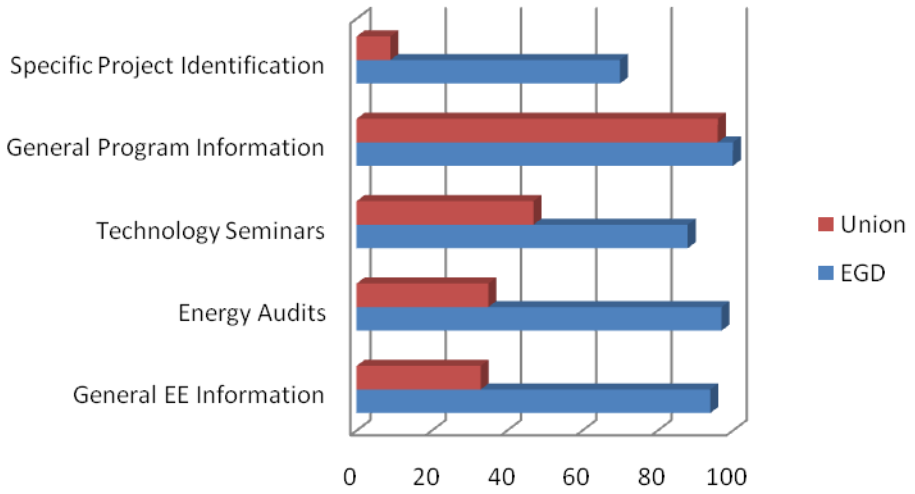
	Yes	Total	%
EGD	34	34	100
Union	27	40	68

Trade allies were asked "Do you recall receiving energy efficiency information and/or training in any of the following areas that was sponsored or delivered by Union Gas/Enbridge Gas Distribution?" Almost all remembered getting general program information (Table 6-9 and Figure 6-5). Among the EGD trade allies, almost all remembered getting information or training in energy audits and general energy efficiency information, compared to around one third for Union trade allies. Over two thirds of EGD respondents recalled getting "specific project identification" compared to nine percent for Union.

Table 6-9 % of Mentions by Utility

	EGD	Union
General Program Information	100	96
Energy Audits	97	35
General EE Information	94	33
Technology Seminars	88	47
Specific Project Identification	70	9
Software	0.38	0.20
Lunch N Learns	0.26	0.22

Figure 6-5. Percent Recall Information Etc. by Utility



6.3 Sector-Specific Answers to Key Questions

This section will present answers to the questions that carry the most weight in the free ridership calculations broken out by utility and sector. The results are presented as percentages after sector weights have been applied. This corresponds to the weighting used when the sector-specific free ridership results were calculated. The key questions that will be presented in this section are shown in the following table.

Table 6-10. Key Questions Influencing Free Ridership Calculation

Label in Text	Marker in Figure 5-1	Description and Survey Question
Direct Measure Level		
Likelihood and/or Share	[4] and [7]	Free Rider percentage based on likelihood (question E2a) and/or share (question E2b)
Months of Early Replacement	[6]	Number of months program caused the project to be moved forward, used to calculate the early replacement adjustment multiplier (question E1a)
Direct Project Level		
Best Estimate of Savings	[14]	Interviewee best estimate of the extra savings that would have been achieved without the program (question E3).
Program Influence Project Level		
Planning	[H]	Project planning interviewer score (question D3b)
Influence	[G]	Interviewer-assigned influence score (question D2b)
Importance	[F]	Program importance participant score (question D1)

The sector level free ridership results are shown in Tables E-1 and 5-1, which can be summarized as follows:

EGD: Industrial and Agriculture are relatively higher than Commercial Retrofit, Multifamily, and New Construction with Commercial Retrofit being particularly low.

Union: Commercial Retrofit and Industrial are relatively higher than Multifamily and New Construction with Agriculture being particularly low (zero).

The discussion of the question-specific results will address those sector differences. Those sectors that saw relatively high free ridership rates are shaded in the tables that follow.

6.3.1 Direct Measure Level

Likelihood and/or Share. Respondents were asked to estimate the *likelihood* that they would have incorporated measures "of the same high level of efficiency" if not for the financial and technical assistance of the program (Figure 5-1 [4]). In cases where respondents indicate that they may have incorporated some, but not all, of the measures, they are asked to estimate the *share of measures* that would have been incorporated anyway at the same level of high-efficiency. The answers they gave were converted into a free ridership percentage, which is shown in the following table.

EGD Notes: In the industrial sector, 67% of the respondents had free ridership scores of 70% or more based on this measure, which was significantly higher than the other sectors, and 89% of the agriculture respondents had free ridership scores at 50% or higher.

Union Gas Notes: Fully 84% of the commercial retrofit respondents had free ridership scores of 100% based on this measure. The industrial scores were somewhat better than multifamily and new construction on this measure. Most of the very largest industrial companies had very high free ridership rates in this area, which is the primary driver of the final free ridership score.

Table 6-11. Likelihood and/or Share – EGD

Free Ridership Percent	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
0	0%	29%	42%	25%	39%
10	0%	0%	0%	0%	0%
20	11%	0%	2%	0%	0%
25	0%	0%	5%	0%	3%
30	0%	0%	0%	8%	0%
40	0%	0%	0%	0%	0%
45	0%	0%	0%	0%	6%
50	44%	5%	14%	25%	0%
60	11%	0%	0%	0%	0%
65	0%	0%	0%	0%	3%
70	0%	10%	7%	0%	0%
75	11%	19%	2%	0%	0%
80	0%	14%	9%	0%	3%
85	11%	0%	0%	21%	0%
90	0%	0%	5%	4%	0%
100	11%	24%	14%	17%	47%
Total	100%	100%	100%	100%	100%
N	9	22	56	24	44

Table 6-12. Likelihood and/or Share – Union Gas

Free Ridership Percent	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
0	67%	6%	0%	0%	5%
30	0%	17%	0%	0%	0%
40	0%	0%	6%	0%	0%
50	0%	17%	13%	8%	0%
60	11%	0%	0%	0%	0%
70	0%	6%	0%	0%	0%
75	0%	0%	6%	0%	0%
80	22%	6%	6%	25%	5%
85	0%	6%	0%	0%	0%
90	0%	6%	13%	8%	5%
100	0%	39%	56%	58%	84%
Total	100%	100%	100%	100%	100%
N	8	19	17	12	20

Early Replacement Adjustment Multiplier. On a measure-by-measure basis, respondents were asked if the program influenced them to install the equipment more than one year earlier than they otherwise would have otherwise. If it had, they were asked when they would have installed the equipment without the program (Figure 5-1 [6]). That answer was converted to months and then converted to a percentage multiplier to discount the measure-specific free ridership rate. The answers given are shown below.

EGD Notes: Few projects were moved forward in time in most sectors except for the multifamily sector.

Union Gas Notes: Very few projects in any sector were moved forward by more than 12 months, with the exception of commercial retrofit.

Table 6-13. Months the Program Moved the Project Forward in Time – EGD

Months	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
0	67%	86%	14%	100%	82%
2	0%	7%	7%	0%	0%
6	0%	7%	7%	0%	0%
9	0%	0%	11%	0%	0%
12	17%	0%	29%	0%	0%
18	0%	0%	14%	0%	0%
24	17%	0%	4%	0%	6%
36	0%	0%	11%	0%	0%
240	0%	0%	4%	0%	12%
Total	100%	100%	100%	100%	100%
N	6	15	32	9	20

Table 6-14. Months the Program Moved the Project Forward in Time – Union Gas

Months	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
0	0%	92%	0%		50%
6	0%	8%	0%		0%
9	0%	0%	100%		0%
12	100%	0%	0%		0%
24	0%	0%	0%		50%
Total	100%	100%	100%		100%
N	1	13	6	0	3

6.3.2 Direct Project Level

Best Estimate of Savings. Respondents are asked to give an upper, lower and their best estimate [10] of the overall energy savings attributable to the program across all measure categories. If a "best estimate" is not provided, the midpoint between the lower and upper bound is used (Figure 5-1 [14]). Their answers are presented in the following two tables.

EGD Notes: Only two agriculture respondents answered this question, which minimized its effect on this sector, although both said 100% of the savings were attributable to the program. Industrial respondents attributed relatively more of the savings to the program, which would tend to *reduce* their free ridership score.

Union Gas Notes: Industrial and commercial retrofit respondents attributed relatively more of the savings to the program, which would tend to *reduce* their free ridership score.

Table 6-15. Respondent Estimate of Savings Attributable to the Program – EGD

Savings Attributable to the Program (%)	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
0	0%	6%	19%	8%	0%
10	0%	0%	0%	0%	0%
20	0%	0%	12%	17%	36%
25	0%	6%	0%	0%	0%
35	0%	0%	7%	0%	0%
50	0%	0%	17%	0%	8%
65	0%	0%	5%	0%	0%
70	0%	6%	10%	0%	0%
75	0%	11%	0%	0%	8%
80	0%	17%	14%	25%	6%
85	0%	11%	5%	21%	0%
90	0%	0%	2%	0%	0%
100	100%	44%	10%	29%	42%
Total	100%	100%	100%	100%	100%
N	2	20	56	24	44

Table 6-16. Respondent Estimate of Savings Attributable to the Program – Union Gas

Savings Attributable to the Program (%)	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
0	75%	6%	0%	0%	5%
20	0%	0%	0%	0%	0%
40	0%	0%	0%	8%	0%
50	0%	19%	14%	0%	0%
70	0%	0%	14%	0%	0%
80	0%	6%	7%	25%	0%
90	0%	0%	0%	17%	0%
100	25%	69%	64%	50%	95%
Total	100%	100%	100%	100%	100%
N	7	15	16	12	20

6.3.3 Program Influence Project Level

Planning. Point [H] in Figure 5-1 is an interviewer score of the amount of planning that went on for the measure before the program got involved, based on open-ended questions to the respondent and probing questions as appropriate. The planning score shown in the following tables is on a scale where 5 indicates that respondent had no plans at all and 1 indicates that respondent had documented plans and had budgeted for all of the efficient equipment.

EGD Notes: Compared to the other sectors, only commercial retrofit stands out as having respondents who had relatively far advanced plans prior to program involvement so this question does not contribute meaningfully to explaining the high free ridership scores for agriculture and industrial.

Union Gas Notes: Three quarters of the commercial retrofit respondents had planning scores of 2 or 1, significantly more than the other sectors. The 42% of industrial respondents having a planning score of 1 is significantly higher than agriculture and multifamily, but less than new construction. Most of the very largest industrial companies had planning scores of 1 or 2.

Table 6-17. Project Planning Score – EGD

Planning Score	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
1	11%	13%	18%	17%	22%
2	11%	9%	7%	0%	14%
3	0%	0%	4%	0%	8%
4	11%	48%	31%	25%	44%
5	67%	30%	40%	58%	11%
Total	100%	100%	100%	100%	100%
N	9	23	56	24	41

Table 6-18. Project Planning Score – Union

Planning Score	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
1	22%	42%	7%	50%	58%
2	0%	0%	27%	0%	16%
3	0%	16%	53%	0%	16%
4	0%	26%	0%	25%	0%
5	78%	16%	13%	25%	11%
Total	100%	100%	100%	100%	100%
N	8	19	16	12	19

Influence. Point [G] Figure 5-1 is an interviewer score of the program's influence on the type, efficiency and quantity of the equipment installed. The driving question at [G] was as follows: "Did the assistance you received from [Enbridge/Union] in any way influence your capital funding acquisition process, the type or efficiency level of the equipment or the amount of high efficiency equipment you installed or process changes implemented?" After asking probing questions to understand the answer, the interviewer assigns a 1-5 score where "1" indicates that the program had no influence and "5" indicates that the

program was the primary reason that energy efficient equipment was installed. The results are in the following tables.

EGD Notes: Agriculture and industrial respondents are somewhat more likely to score low on this question than multifamily and commercial retrofit (33% agriculture and 29% industrial at 3 or lower compared to 16% multifamily and 25% commercial retrofit) with a low score being correlated with a higher free ridership score.

Union Gas Notes: All commercial retrofit respondents got a program influence score of 3 or lower, which was significantly lower than the other sectors. The industrial respondents had lower program influence scores than the agriculture respondents but higher than the other sectors.

Table 6-19. Program Influence – EGD

Program Influence	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
1	0%	0%	0%	0%	4%
2	0%	6%	0%	25%	7%
3	33%	24%	16%	42%	14%
4	67%	35%	35%	0%	4%
5	0%	35%	48%	33%	71%
Total	100%	100%	100%	100%	100%
N	3	17	35	24	35

Table 6-20. Program Influence – Union Gas

Program Influence	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
1	0%	0%	0%	0%	50%
2	0%	10%	0%	20%	25%
3	0%	30%	67%	60%	25%
4	0%	50%	0%	20%	0%
5	100%	10%	33%	0%	0%
Total	100%	100%	100%	100%	100%
N	6	11	3	5	5

Importance. Point [F] in Figure 5-1 represents several questions on the importance of several program components or types of assistance in the participant's decision to install energy efficiency equipment. The maximum score among those questions is carried forward in the calculation where 1 is "not at all important" and 5 is "very important". The maximum score by sector is shown in the following tables.

EGD Notes: Over half of the Agriculture respondents had an importance score of 3 or less, with lower numbers correlated with higher free ridership. This was significantly lower than the other sectors. The industrial scores were lower than multifamily and new construction.

Union Gas Notes: Commercial retrofit importance scores were significantly lower than the other sectors. Industrial importance scores were higher than the other sectors.

Table 6-21. Program Importance – EGD

Importance	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
1	11%	0%	0%	0%	3%
2	11%	0%	0%	0%	3%
3	33%	22%	0%	4%	16%
4	22%	26%	14%	38%	3%
5	22%	52%	86%	58%	76%
Total	100%	100%	100%	100%	100%
N	9	23	56	24	44

Table 6-22. Program Importance – Union Gas

Importance	Agriculture	Industrial	Multifamily	New Construction	Commercial Retrofit
1	0%	0%	7%	0%	37%
2	22%	0%	7%	8%	21%
3	0%	6%	13%	17%	5%
4	0%	50%	13%	75%	16%
5	78%	44%	60%	0%	21%
Total	100%	100%	100%	100%	100%
N	8	19	17	12	20

6.3.4 Summary

The following table summarizes the top-level information from the previous tables. It indicates which questions are driving the results for each of the sectors with relatively high free ridership rates.

Table 6-23. Summary of Sector-Specific Questions on High Free Ridership Sectors

Label in Text	EGD Industrial	EGD Agriculture	Union Gas Industrial	Union Gas Commercial Retrofit
Direct Measure Level				
Likelihood and/or Share	High	High	High*	High
Months of Early Replacement				
Direct Project Level				
Best Estimate of Savings	Low	Low	Low	Low
Program Influence Project Level				
Planning			Medium High*	High
Influence	Medium	Medium	Low	High
Importance	Medium	High	Low	High

High = Answers strongly supported the relatively high free ridership scores for these sectors.
High = High for the very largest industrial participants.*
Medium = Answers somewhat supported the relatively high free ridership scores for these sectors.
Low = Answers tended to bring down the free ridership scores for these sectors compared to other sectors.
Blank = Answers neither support nor contradict the free ridership scores.

EGD Summary. The high EGD industrial free ridership results are driven by high scores in the Likelihood and/or Share questions with support from the Influence and Importance questions. The high EGD agriculture free ridership results are driven by high scores in the Likelihood and/or Share and Importance questions with support from the Influence questions.

The EGD commercial retrofit has a relatively low free ridership rate at 12%. This sector had scores corresponding to low free ridership rates on four of the six main questions examined:

- Likelihood and/or Share: One of the lowest free ridership scores.
- Best estimate of savings: One of the highest estimates with 42% saying 100%
- Influence: The highest score (corresponding to a low free ridership rate), with 71% with a score of 5
- Importance: The second to the highest score (corresponding to a low free ridership rate), with 76% with a score of 5.

Union Gas Summary. The Union Gas commercial retrofit respondents show answers correlated with high free ridership results across most questions examined, except the Best Estimate of Savings.

The Union Gas industrial free ridership results are driven by the responses of a small number of very large industrial participants, who are significantly larger than the other Union Gas industrial participants (based on gross m^3 savings). The scores of these large participants on the Likelihood and/or Share and Project Planning questions were the primary drivers in their high free ridership scores.

6.4 Free Ridership, Spillover, and Net-to-Gross from Other Jurisdictions

Free ridership, spillover, and net-to-gross ratios from other jurisdictions can put the Union and EGD results in context.

The Database for Energy Efficiency Resources (DEER) is one commonly-cited source for free ridership numbers. DEER developed by the California Public Utilities Commission and the California Energy Commission, with support and input from the Investor-Owned Utilities and other interested stakeholders. The net-to-gross ratios in DEER take only free ridership into account and not spillover. As of late 2006 the DEER net-to-gross rates were as follows:[40]

0.83 Commercial and agricultural information, tools, or design assistance services
0.80 Default
0.96 Express Efficiency (rebates)
0.83 Energy Management Services, including audits (for small and medium customers)
0.74 Industrial Information and Services
0.70 Large Standard Performance Contract
0.80 All other nonresidential programs

[40] DEER is currently being updated and is off-line as of this writing. The original source of these numbers was : http://eega.cpuc.ca.gov/deer/Ntg.asp.

In 2006, Summit Blue researched the free ridership and spillover rates that have been found in studies in recent years. The results of that benchmarking exercise are presented in the following pages (with some slight updates from studies we are aware of that occurred since 2006). The 79% net-to-gross ratio for EGD is in the same range as several of the programs examined. The 56% ratio for Union Gas is lower than those found in this research.

Table 6-24. Results from Other Jurisdictions

State/Region	Utility	Program Name	Report Title	Year of Research	Program Description	Market Sector	Measures Covered	Free ridership values	Total Spillover Value	NTG Ratio
California	PG&E	Advanced Performance Options (All Measures)	Evaluation of Pacific Gas and Electric Company's 1997 Commercial Energy Efficiency Incentives Program: HVAC Technologies PG&E Study ID number: 333B	1999		Commercial	Adjustable Speed Drives, Water Chillers, Customized EMS, Convert to VAV, Other Custom Equipment, Other HVAC Technologies	0.46	0.21	0.75
California	PG&E	Commercial Energy Efficiency Incentives Program: Lighting Technologies	Evaluation of Pacific Gas and Electric Company's 1997 Commercial Energy Efficiency Incentives Program: Lighting Technologies PG&E Study ID number: 333A	1999	This evaluation covers indoor lighting technology retrofits that were rebated during 1997. These retrofits were performed under three different PG&E programs: the Retrofit Express (RE), Customized Efficiency Options (CEO) and Advanced Performance Options (APO) Programs.	Commercial	Lighting	0.24	0.05	0.82
California	Southern California Edison	Non-Residential Financial Incentives Program	Evaluation of the Southern California Gas Company 2004-05 Non-Residential Financial Incentives Program June 7, 2006	2006	The program focuses on small to medium nonresidential gas customers served under core rate schedules. The program incorporates technical support, education, training, outreach, contractor referral, prescriptive rebates and equitable financial incentives through three program elements.	Small and Medium Commercial, Agricultural, and Industrial		0.3	10% (not evaluated, just an estimate)	0.8
California	PG&E	Retrofit Efficiency Options Program	Evaluation of Pacific Gas and Electric Company's 1997 Commercial Energy Efficiency Incentives Program: HVAC Technologies PG&E Study ID number: 333B	1999	The REO program targeted commercial, industrial, agricultural, and multi-family market segments. Customers were required to submit calculations for the projected first-year energy savings along with their application prior to installation of the high efficiency equipment. PG&E	Commercial, Industrial, Agricultural, and Multifamily	Adjustable Speed Drives, Water Chillers, Cooling Towers	0.46	0.21	0.75

State/Region	Utility	Program Name	Report Title	Year of Research	Program Description	Market Sector	Measures Covered	Free ridership values	Total Spillover Value	NTG Ratio
					representatives worked with customers to identify cost-effective improvements, with special emphasis on operational and maintenance measures at the customers' facilities. Marketing efforts were coordinated amongst PG&E's divisions, emphasizing local planning areas with high marginal electric costs to maximum the program's benefits.					
California	PG&E	Retrofit Express Program	Evaluation of Pacific Gas and Electric Company's 1997 Commercial Energy Efficiency Incentives Program: HVAC Technologies PG&E Study ID number: 333B	1999	The RE program offered fixed rebates to customers who installed specific electric energy efficient equipment. It covered covers lighting, air conditioning, refrigeration, motors, and food service. Customers were required to submit proof of purchase with their applications in order to receive rebates. The program was marketed to small- and medium-sized commercial, industrial, and agricultural (CIA) customers.	Small and Medium Commercial, Industrial, and Agricultural Customers	Central A/C, Adjustable Speed Drives, Package Terminal A/C, Set-Back Thermostat, Reflective Window Film, Water Chillers, Other HVAC Technologies	0.39	0.21	0.82
California		SPC	2003 Statewide Nonresidential Standard Performance Contract (SPC) Program Measurement And Evaluation Study	2005	The program offered fixed-price incentives to project sponsors for kWh energy savings achieved by the installation of energy-efficiency measures. The fixed price per kWh, performance measurement protocols, payment terms, and other operating rules of the program were specified in a standard contract. PG&E and SDG&E also offer incentives for energy efficient gas measures.	Nonresidential	Lighting, lighting controls, VSDs, HVAC	49% / 59% / 35% / 55% / 41% (1999-2003)	5% (not evaluated, just an estimate)	63% (for 2002-2003)
Colorado	Xcel	Bid 2001 Program	Impact and Process Evaluation of the Bid 2001 Program	2003	Demand-side bidding program that acquires demand reductions by	Commercial and Industrial		0.36	0.06	0.7

State/Region	Utility	Program Name	Report Title	Year of Research	Program Description	Market Sector	Measures Covered	Free ridership values	Total Spillover Value	NTG Ratio
					soliciting proposals for demand reduction projects from customers, and third-party bidders contractors. This program has subsequently been succeeded by the Custom Efficiency program.					
Colorado	Xcel	Custom Efficiency	Colorado Demand-Side Management Programs Impact, Cost-Effectiveness, Process, and Customer satisfaction Evaluations	2005	Launched on December 1, 2001, this program is a C&I DSM bidding program and successor to Bid 2001. The program's goal is to obtain reliable and verifiable electric demand reduction in Company's Front Range service territory. To participate, eligible customers and qualified providers of energy related services respond to RFPs seeking electric demand reduction projects within eligible facilities.	Commercial and Industrial		0.398	0.139	0.741
Massachusetts/ New Hampshire	National Grid	Accelerated Application Process	National Grid 2001 Commercial and Industrial Free-ridership and Spillover Study	2002				0.121	0.146	1.025
Massachusetts/ New Hampshire	National Grid	Comprehensive Project	National Grid 2001 Commercial and Industrial Free-ridership and Spillover Study	2002				0.154	0.109	0.955
Massachusetts/ New Hampshire	National Grid	Design 2000plus	National Grid 2001 Commercial and Industrial Free-ridership and Spillover Study	2002	The program offers technical assistance and financial incentives to large commercial and industrial customers who are building new facilities, adding capacity for manufacturing, replacing failed equipment or undergoing major renovations.	Large Commercial and Industrial	Motors, VFD, HVAC, Lighting, Custom	0.307	0.188	0.881
Massachusetts/ New Hampshire	National Grid	Energy Initiative Program	National Grid 2001 Commercial and Industrial Free-	2002	The program offers technical assistance and incentives to help large C&I customers	Large Commercial and Industrial	Motors, VFD, HVAC, Lighting,	0.096	0.111	1.015

State/Region	Utility	Program Name	Report Title	Year of Research	Program Description	Market Sector	Measures Covered	Free ridership values	Total Spillover Value	NTG Ratio
			ridership and Spillover Study		purchase energy-efficient measures for their existing facilities.		Custom			
Massachusetts	NSTAR	Business Solutions	PY2002 Business Solutions Impact Evaluation for NSTAR Electric	2004	The program provides technical and financial assistance to NSTAR Electric's commercial, industrial, and institutional customers (except in Cape Light Compact territory) to facilitate the installation of energy saving equipment in existing buildings.	Commercial, Industrial, Institutional	Lighting, lighting controls, VSDs, HVAC, EMS, Refrigeration, Compressed Air, Motors	0.277	0.103	0.854
Massachusetts	NSTAR	Construction Solutions	Construction Solutions Program Year 2002 Impact Evaluation Final Report	2004	The program (previously the C&I New Construction Program) offers technical and financial assistance to design professionals and developers to promote the use of efficient design measures and electrical equipment in the construction, remodeling, or renovation of commercial and industrial buildings. The program also offers incentives to encourage the installation of energy efficient replacement equipment when existing systems fail during operation or at the time of purchasing new equipment.	Commercial and Industrial	Chillers, VSDs, Refrigeration, Lighting, Lighting Controls, Controls, Compressed Air	0.173	0.003	0.848
New York	NYSERDA	CIPP	Commercial/Industrial Performance Program (CIPP) Market Characterization, Market Assessment and Causality Evaluation	2006	CIPP began in June 1998. It provides financial incentives to energy service companies (ESCos) and other contractors to promote energy efficiency capital improvement projects. Program objectives are to: 1) foster the growth of the ESCO industry in New York State and 2) encourage end-use customers to invest in energy-efficient equipment based on the potential	Commercial and Industrial	Lighting, EMS, motors and VSDs, unitary HVAC and chiller replacements, heat pump water heaters, Energy Star vending machines, custom measures with paybacks of greater than one year, including	0.35	0.58	1.04

State/Region	Utility	Program Name	Report Title	Year of Research	Program Description	Market Sector	Measures Covered	Free ridership values	Total Spillover Value	NTG Ratio
					energy cost savings. Eligible energy efficiency measures must reduce electric energy consumption at the project site and this reduction must be measurable and verifiable. In addition, cost effective renewable energy measures and measures that reduce summer peak demand are eligible for funding consideration as custom measures whether or not electric energy consumption is reduced.		renewable measures and measures that reduce peak summer demand.			
New York	NYSERDA	New Construction Program (NCP)	New Construction Program (NCP) Market Characterization, Market Assessment, and Causality (MCAC)	2006	This comprehensive evaluation covered the period from program inception through year-end 2005. In late 2006, the MCAC Team was tasked with updating certain aspects of the earlier comprehensive evaluation effort. This report discusses the results of the update work.	Commercial and Industrial		0.40	0.85	1.22
New York	NYSERDA	Technical Assistance Program	Technical Assistance Program Market Characterization, Market Assessment And Causality Evaluation	2007	The Program provides customers with objective, customized information by funding detailed energy studies capable of facilitating better energy efficiency, energy procurement, and financing decisions.	Commercial and Industrial		0.27	0.44	1.17

7 CONCLUSIONS

The total free ridership rate across both utilities and all sectors is 48% as shown in Table 7-1. The free ridership rate for EGD is 41% and it is 54% for Union Gas. Summit Blue recommends that the utilities use the utility-specific total free ridership values of 41% and 54% as the best estimate of free ridership. Those results are based on larger sample sizes than the sector-specific results and proved more stable in the sensitivity analysis. The sector-specific results are based on smaller sample sizes and should only be used to support program management, for example to support targeting and marketing decisions.

Table 7-1. Free Ridership Results

Sector	EGD	Union	Total
Agriculture	40%	0%	18%
Commercial Retrofit	12%	59%	27%
Industrial	50%	56%	53%
Multifamily	20%	42%	26%
New Construction	26%	33%	28%
Total	41%	54%	48%

Assumptions (See Figure 2.1 for the interpretation of these assumptions):

Weight of Participant Reported Importance [F] in [K] compared to the planning [H] and influence [G] scores	Triple weight
Weight of Project-based estimate [14] in [20] compared to the measure-specific scores [9]	Triple Weight
Weight of Program Influence Score [L] compared to the Project-Based score [21]	Equal Weight

Summit Blue recommends the utilities use following spillover rates:

Table 7-2. Spillover Results

Spillover Type	EGD	Union	Base
Participant Inside Spillover	5%	5%	Of gross reported savings
Participant Outside Spillover	5%	5%	Of gross reported savings
Audit-Only Spillover	35%	0%	Of gross audit-recommended savings
Nonparticipant Spillover	0%	0%	

Summit Blue recommends the utilities use the following net-to-gross ratios, reflecting both free ridership and spillover:

Table 7-3. Net-to-gross Results

	EGD	Union
Net-to-gross ratio	79%	56%

Appendix A. Revised Analysis Plan

Appendix B: Survey Instruments

APPENDIX A

CUSTOM PROJECT FREE RIDERSHIP AND SPILLOVER STUDY ANALYSIS PLAN

FINAL

Submitted To:

Union Gas Ltd.

Enbridge Gas Distribution Inc.

January 15, 2008
Annotated July 28, 2008 to reflect decisions made for the final calculations.

SUMMIT BLUE
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Note: The analysis plan presented here has changed from the original approved plan in two ways:
1. Assumptions left undefined in the original plan were finalized.
2. Some details of the free ridership calculation had to be changed to appropriately adjust to realities in the actual data.

INTRODUCTION

This document presents the detailed analysis plan that will govern the free ridership and spillover study for the Custom Projects programs implemented by Enbridge Gas Distribution and Union Gas. This document will present the planned survey and analysis approach and sample design for three surveys:

1. Participant and Trade Ally survey covering free ridership and spillover

2. Participant Audit-Only survey covering spillover

3. Nonparticipant Survey covering spillover.

Finally, this document will outline the final report.

Approach Overview

Free ridership and spillover will be estimated using data from surveys with participants, nonparticipants, trade allies, and utility staff. This approach is based primarily on participant self-reported information along with other perspectives to triangulate the net-to-gross estimates. It is the most common and generally accepted approach to measuring free ridership and spillover in a commercial and industrial energy efficiency program.

Experienced utility industry consultants will personally conduct the interviews and most will be done on-site. This is standard practice for our firm where estimating attribution[1] is a primary objective of the research. Typically the internal champion in an industrial firm will have the most complete information on influences, and this information can best be extracted in an in-person interview which encourages the free flow of significant information.

To address the possibility of respondent bias, the interviews will approach each topic from a variety of directions. The interviewer has the discretion to probe for supporting information and the analysis process checks for consistency across answers. Interviewees will be promised confidentiality and assured that their answers will not affect the incentives or support they have received from the program. To address the possibility of interviewer bias, each interviewer will be trained in the purpose of the research and the importance of objectively probing and recording responses. Three different interviewers will perform the interviews and the data from their interviews will be compared to look for uneven application of the methodology. The interviewers chosen for this effort each have a long history of tackling evaluation projects from an objective point of view.

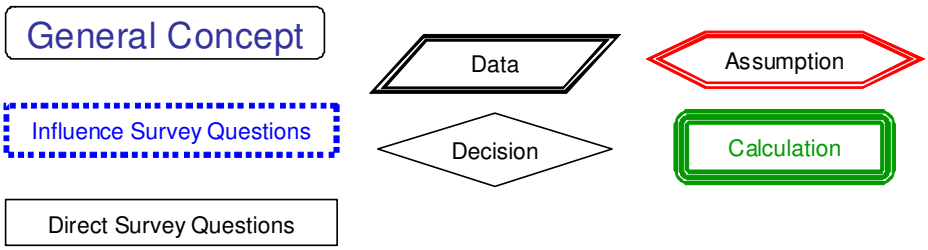
[1] In this study and Analysis Plan, "attribution" is defined as the combined program market influence of free ridership and spillover.

Introduction to the Flow Diagrams

The description below contains references to diagrams of the flow of survey questions and analysis logic shown after page 7. The first diagram (Figure 3) shows a high-level overview of the analysis and survey logic. The revised version of Figure 3 shows revisions to the general approach and the weights given to various parts of the analysis in the calculations used to produce the final, recommended results. Figures 4 through 6 show the direct question sequence with Figure 4 showing the measure-level approach, Figure 5 the project-level approach, and Figure 6 the combined approach. Figure 7 shows the program influence sequence, and Figure 8 shows the combination of the direct and program influence sequences to produce the final results.

Key points in the diagrams are labeled with bold, large numbers and letters. Those labels are referred to in the text in brackets, e.g., [1] [2] [A] [B]. Key assumptions in the logic are noted in the text with bold, italics set off by < > symbols (e.g., ***<Average>***). Key assumptions in the diagrams are noted with the figure labeled "Assumption" shown in the key in Figure 1.

Figure 1. Key to Symbols in the Analysis Diagrams



PARTICIPANT SURVEY – FREE RIDERSHIP

This section will first outline the survey and analysis approach for the participant and trade ally survey, covering the free ridership aspect, and then discuss the sample design.

Participant and Trade Ally Survey and Free Ridership Analysis Approach

We will design and implement surveys with participating end users and trade allies (Channel Partners for Union Gas and Business Partners for Enbridge) to measure free ridership and spillover. The discussion that follows is largely written with the participants in mind. The survey for the trade allies follows the same general logic and they will be asked for their opinion on the impact of the program on specific participants. (The spillover approach will be discussed in the following section.)

Figure 3 presents an overview of the survey and analysis approach. Free ridership will be discussed with each respondent in both **direct questions** aimed at obtaining respondent estimates of the appropriate (full or partial) free ridership rate to apply to them, and in **supporting or influencing questions** used to verify whether direct responses are consistent with participants' views of the program's influence on their equipment investment decisions. The direct questions will be asked at the measure level and at the whole

project level. They will then be combined into a single, project-level direct free ridership score. Direct and program influence scores are combined into the final project-level free ridership score. That project-level score is weighted by program-reported savings to calculate the final savings-weighted free ridership percentage. Each of these steps is explained in more detail below, corresponding to the diagrams following Figure 3.

Direct Free Ridership Questions

The direct free ridership questions are posed first for each major category of measures that were reported to the program (*e.g.,* HVAC, building controls, process technologies) (Figure 4), and then for the project as a whole (Figure 5). The measure-level and project-level results are combined in the analysis (Figure 6). For the measure-specific questions, respondents are first asked when, if at all in the foreseeable future, they would have replaced existing equipment or installed new equipment if not for the technical and financial assistance of the program (Figure 4 [1]).

Respondents are then asked to estimate the *likelihood* that they would have incorporated measures "of the same high level of efficiency" if not for the financial and technical assistance of the program (Figure 4 [4]). In cases where respondents indicate that they may have incorporated some, but not all, of the measures, they are asked to estimate the *share of measures* that would have been incorporated anyway at the same level of high-efficiency. This flexibility in how respondents could conceptualize and convey their views on free ridership allows respondents to give their most informed answer, thus improving the accuracy of the free ridership estimates.

Additional direct project-level free ridership questions are then asked to obtain a lower bound, an upper bound, and a best estimate of overall energy savings attributable to the program across all measure categories (Figure 5 [10, 11, 12]). These questions focus on incremental savings from incorporating high-efficiency equipment or controls instead of standard-efficiency equipment and controls. The questions are asked after measure-specific questions so respondents have the decisions they made on individual measures fresh in their minds. Asking respondents about a lower and an upper bound has been successfully used by Summit Blue in several past net-to-gross studies to help respondents narrow down the possible range of free ridership values before making a best estimate.

Program Influence Questions

The **"program influence"** questions (Figure 7) are designed to clarify the role that program interventions (*e.g.*, technical assistance and financing) played in decision-making, and to provide supporting information on free ridership. Questions address the following topics:

- Figure 7 [A] – The importance of features of the program in the decision to incorporate high-efficiency measures in the project. The dimensions include the following:
  - program technical assistance
  - program financial assistance
  - ongoing relationship with the utility (providing impartial advice and facilitating unbiased contacts, e.g., business partners)
  - utility education activities
    - providing best practice information through case studies, as well as specific industry adoption, proven track records, operating experience to help instill confidence etc.
    - training, workshops, and seminars to improve the general or specific knowledge and competencies of customers
    - on-going advertisements re: energy efficiency to heighten customer awareness and concerns

- promotion of energy efficiency at conferences, trade shows and other industry events

- Figure 7 [B] – The influence of the program on the type or efficiency level of the measures, or the amount of high-efficiency measures, incorporated into the project.
  - Figure 7 [B1] – Each respondent indicating some degree of program influence was asked to describe how the program influenced the decision to install high-efficiency equipment in the project.

- Figure 7 [C] – The customer's plans (or lack thereof) to incorporate the energy efficiency measures included in the project prior to participating in the program.
  - Figure 7 [C1] – Each respondent indicating any degree of planning for high efficiency prior to participating in the programs is asked to describe these plans in detail and is asked for the equipment type, timing, quantity, and efficiency, as well as for any prior budgeting for the high efficiency equipment.

Program influence questions are both closed-ended and open-ended and may require probing by experienced interviewers to elicit complete responses that accurately reflect the level of program influence. If the responses are inconsistent across the three types of questions, the interviewer will probe to attempt to resolve the inconsistency (Figure 7 [J]). Some responses to open-ended questions are quantitatively scored by interviewers using a pre-prepared scoring guide (Figure 7 [G][H]), while other questions ask respondents directly to quantify program influence (Figure 7 [F]).

Using the Participant and Trade Ally Survey Responses to Estimate Free Ridership

Direct Free Ridership Estimate

The direct free ridership estimate is based on both the measure-specific questions and the "whole project" questions. For each measure category for which the respondent had installed equipment through the program, the survey collects information on when, if ever, the equipment would likely have been installed (Figure 4 [2]) and the *likelihood* that the same high efficiency equipment would have been used, or the *share of high-efficiency measures* that would have been installed (Figure 4 [4]). The response to the likelihood/share-of-measures questions are used as the initial free ridership value for the measure category (Figure 4 [7]). This value is then discounted if the respondent indicated that the program influenced them to install the equipment more than one year earlier than they otherwise would have (Figure 4 [6]). The specific discount values (*i.e.,* adjustment multipliers), when defined, will likely follow the outline presented in Table 1.

Options for the specific discount values (*i.e.,* adjustment multipliers) have not yet been determined. The history and critique task will look for precedents in the field in this area and specific values will then be developed.

Enbridge Gas Distribution designates some projects as "advancement". For "advancement" projects, the TRC calculation already discounts the TRC benefits to account for the period which the program has moved projects forward in time. However, there is no need to modify the survey and analysis to take this into account and Enbridge and Union customers will be asked the same questions, including the timing questions.

Table 1. Early Replacement Adjustment Multipliers

Early Replacement ***Within ____ years of program participation***	Adjustment Multiplier <Assumption>	Early Replacement ***Within __ months of program participation***	Adjustment Multiplier <Final>
Within ___ Months	100%	Within 12 Months	100%
__ Months to __ years	__%	13 to 24 months	75%
__ to __ years	__%	25 to 36 Months	50%
__ to __ years	__%	37 to 48 Months	25%
More than __ years	0%	More than 48 Months	0%

Each measure category is also assigned an energy savings value (in cubic metres (m^3)) from the gas savings recorded for that respondent in the program database (Figure 6 [16]). The direct free ridership estimate for each measure category (after any adjustment for early replacement) is weighted according to the relative savings from the category to determine a weighted average free ridership estimate across all measures (Figure 6 [17]). As it turned out, measure-specific gas savings values were not available for the sample period under examination so this adjustment could not be made and the measure adjusted free ridership value [9] fed straight through to the weighting calculation in [18].

A second direct free ridership estimate is determined based on answers to the direct free ridership questions regarding the lower bound (Figure 5 [12]), upper bound [11], and best estimate [10] of the overall energy savings attributable to the program across all measure categories. If a "best estimate" is provided, this value is used as a second direct free ridership estimate (Figure 5 [14]) in addition to the measure-based estimate discussed above. If a "best estimate" is not provided, the midpoint between the lower and upper bound is used (Figure 5 [13]).[2] The final direct free ridership estimate (Figure 6 [21]) is the ***<weighted average>*** (Figure 6 [20]) of the measure-based estimate [17] and the "best estimate" [14]. If sufficient information is available for only one of these values, then this value is used as the final direct free ridership estimate. ***<Equal weight>*** will be given to the measure-specific and best estimate values to calculate the final direct free ridership estimate (Figure 6 [18][19]). In the final approach, the best estimate values were given three times the weight of the measure-specific estimates.

Program Influence Free Ridership Estimate

As previously discussed, additional questions are included in the surveys to support an analysis of the consistency of responses. Responses to these "program influence" questions are used to adjust the direct free ridership estimates using objective criteria described below. Adjustments are made to individual respondents' free ridership estimates—not to the aggregate free ridership value across respondents. **Adjustments are only made if the respondent's direct free ridership score is beyond the bounds that could reasonably be expected based on responses to the influence questions.** Specifically, the process for whether and by how much to adjust a respondent's direct free ridership estimate is as follows:

Step 1. Calculate an *<average>* program influence score (Figure 7 [L]) (on a 5-point scale) from the scores assigned to the three sets of program influence questions regarding program's importance (Figure 7 [A]), influence of the program [B], and project planning [C]. In the final approach, the importance score [F] was given three times the weight of the Influence [G] and Planning [H] scores (as shown in the revised Figure 3). The ***<maximum score>*** [E] for the program influence dimensions is carried forward in the calculation [F]. A higher score for program influence and importance suggests greater program

[2] Previous research showed that the average "best estimate" was within 3 percentage points of the midpoint.

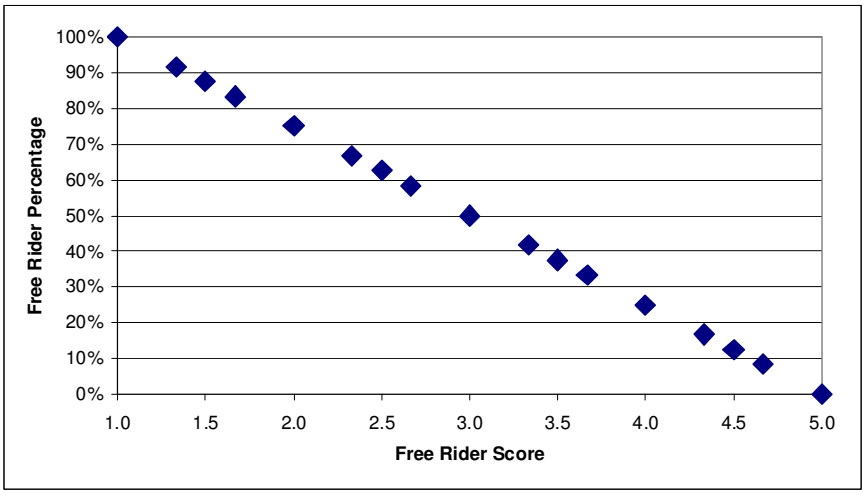
impact, but a higher score for planning indicates lower impact. Therefore, prior to calculating an average score across the three sets of questions, the planning score is inverted so that 1=5, 2=4, etc. In this way, a higher average score across these questions unequivocally represents greater program impact. If the participant's contractor was the most significant influence [D], ***<the results of the trade ally survey will determine the free ridership score>*** [I].

Step 2. Translate the program influence score into a free ridership rate. The influence score has to be converted into a free ridership rate (Figure 7 [M] to [N]) to be used in subsequent calculations. The assumption governing the conversion is that ***<the relationship should be linear>*** with an influence score of 5 converting to 0% free ridership and an influence score of 1 converting to 100% free ridership (see Table 2 and Figure 2).

Table 2. Translate Influence Score to Free Ridership Percentage *<Assumptions>*

Average Influence Score	1.00	1.33	1.50	1.67	2.00	2.33	2.50	2.67	3.00	3.33	3.50	3.67	4.00	4.33	4.50	4.67	5.00
Free ridership	100%	92%	88%	83%	75%	67%	63%	58%	50%	42%	38%	33%	25%	17%	13%	8%	0%

Figure 2. Translate Influence Score to Free Ridership Percentage



<u>Step 3.</u> Define reasonable bounds for the program influence score (Figure 7 [P][Q]). These bounds are intended to reflect the range of free ridership values that could reasonably characterize a project based on a respondent's answers to the program influence questions. For example, if a respondent's program influence score is the maximum possible value of 5.0 (implying that the program was very influential), then a reasonable free ridership value would be as low as 0% and ought to be no higher than 50% to be logically consistent. The width of the range that defines the reasonable bounds (50% in this example) will be identified in the data analysis phase. A reasonable bounds width ought to cause a reasonable number of scores to be adjusted by this step, which probably means less than a third of the scores but more than 5%. Exactly what that "reasonable number" should be can only be determined by examining the results.

Adjusting Direct Estimate with the Influence Estimate

The upper and lower bound estimates derived from the program influence questions are used to adjust the direct free ridership estimate. ***<If the direct free ridership value falls outside of the bounds, then it is***

adjusted to a final free ridership estimate equal to the closest lower or upper bound value> (Figure 8 [AA]). Thus, if the direct free ridership value is higher than the program influence upper bound, then the upper bound is used as the final free ridership value. Conversely, if the direct free ridership value is lower than the program influence lower bound, then the lower bound is used as the final free ridership value.[3] This creates the influence-adjusted, customer-specific final free ridership estimate (Figure 8 [BB]). In the final analysis, because the final direct project level free ridership rate [21] was almost always significantly different from the program influence score [N], the influence upper [Q] and lower bounds [P] had to be very wide or the vast majority of scores were adjusted to the influence bounds. As this gave too much weight to [N], it was decided that a more appropriate approach was to average [21] and [N]. In the final results, [N] and [21] were given equal weights (also shown in Figure 3).

Scaling Customer-Specific Results to the Population

The customer-specific free ridership results are scaled up to the population using project-level energy savings to create a savings-weighted free ridership result (Figure 8). The customer-level free ridership score is multiplied by the customer-level gross energy savings [CC] to calculate customer-level net free rider savings [EE]. The gross and net savings are summed up across all customers and then net savings divided by gross savings produces the final savings-weighted, program-wide free ridership result (Figure 8 [GG]). (Segment-level strata weights, if any, are applied during this step [FF] to calculate the final results.)

[3] The actual calculation shown in the diagram is: Maximum(Lower bound, Minimum(Upper bound, direct free ridership result)).

Figure 3. Free Ridership Analysis – Overview – Original

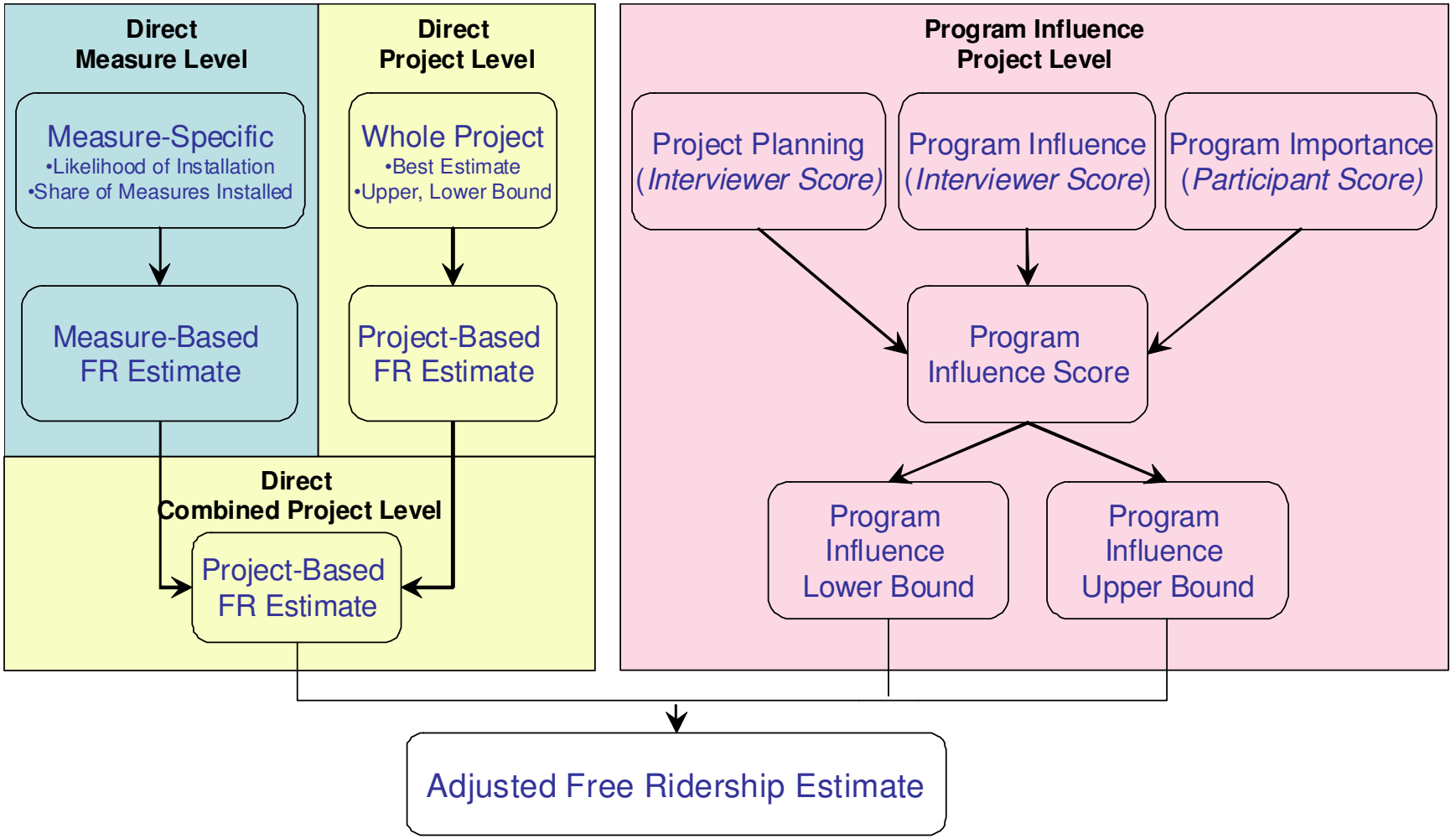


Figure 3. Free Ridership Analysis – Overview – Final Approach

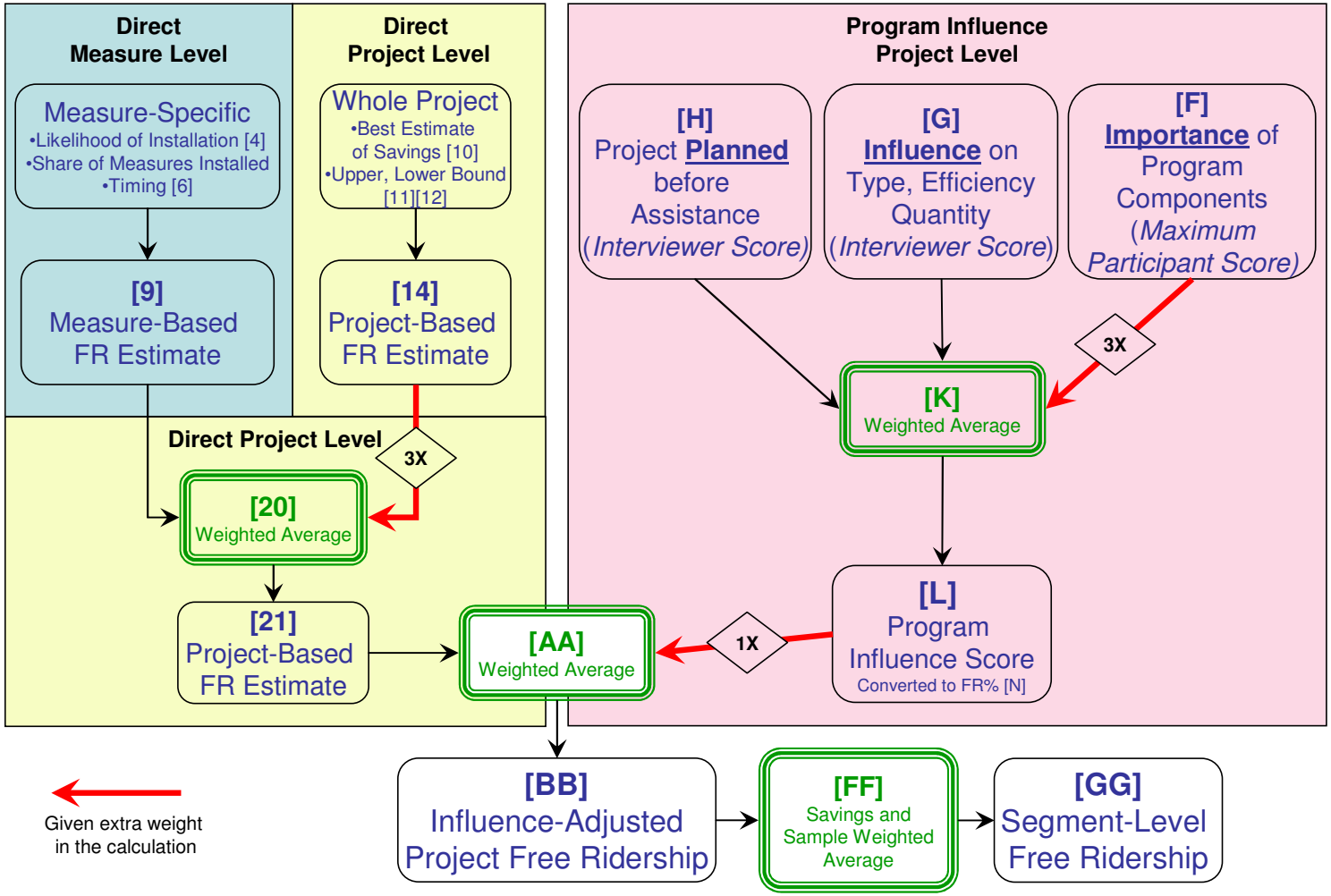


Figure 4. Free Ridership Analysis – Direct, Measure Level

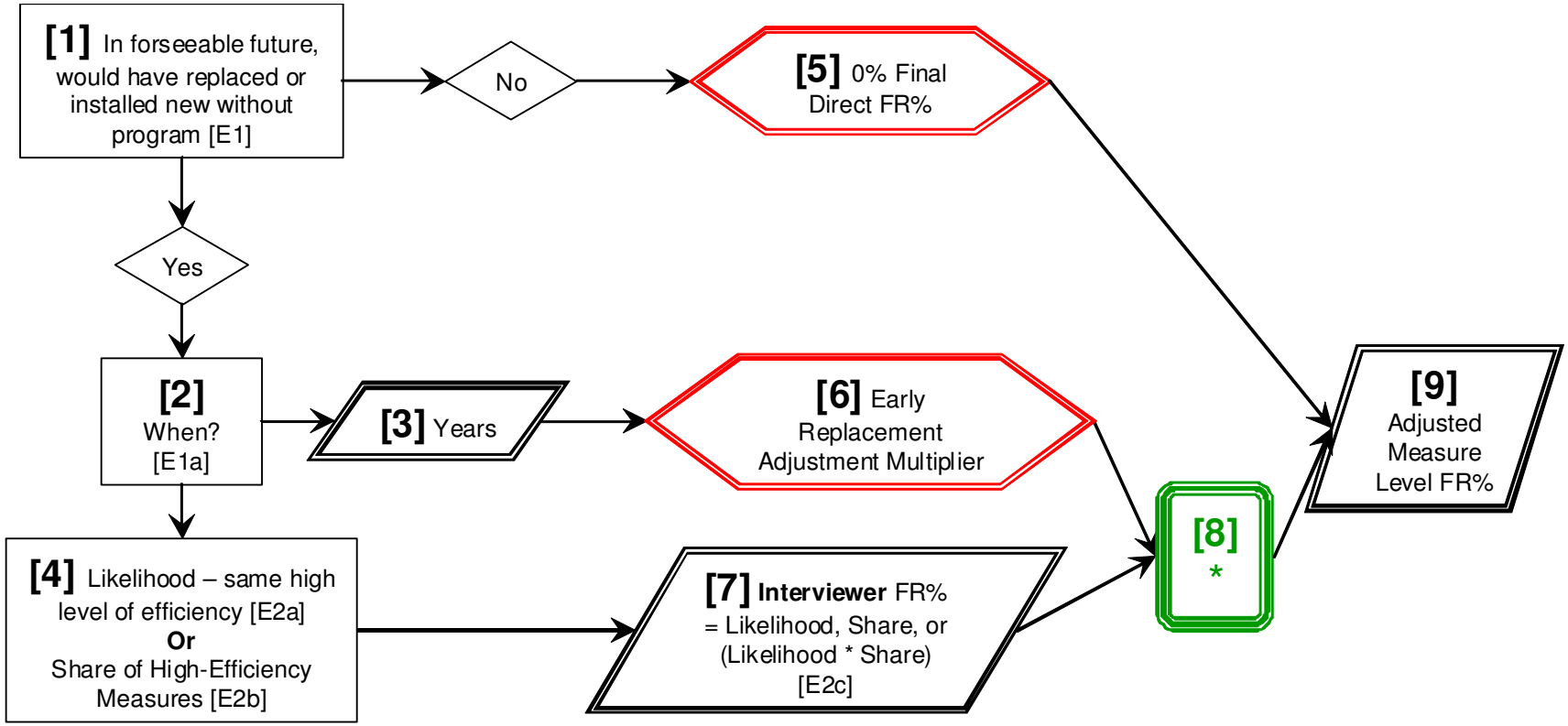


Figure 5. Free Ridership Analysis – Direct, Project Level

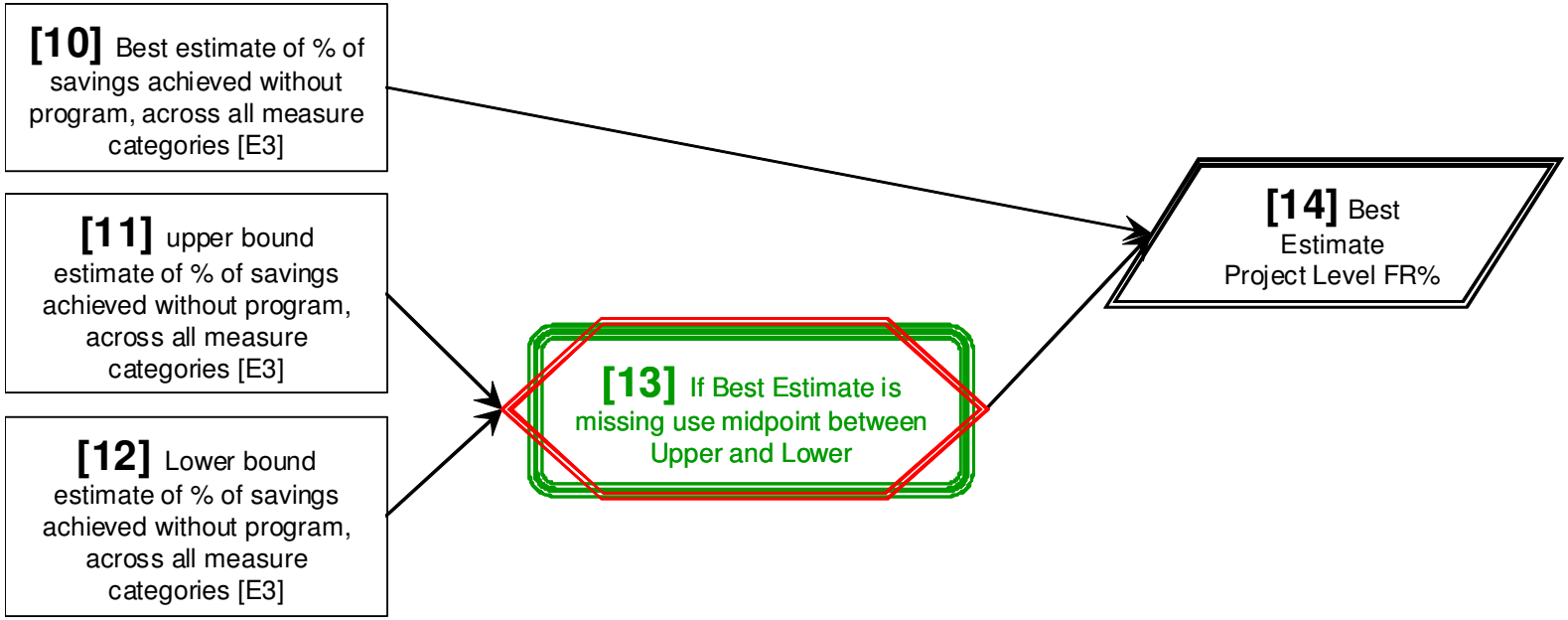


Figure 6. Free Ridership Analysis – Direct, Combined Project Level - Original

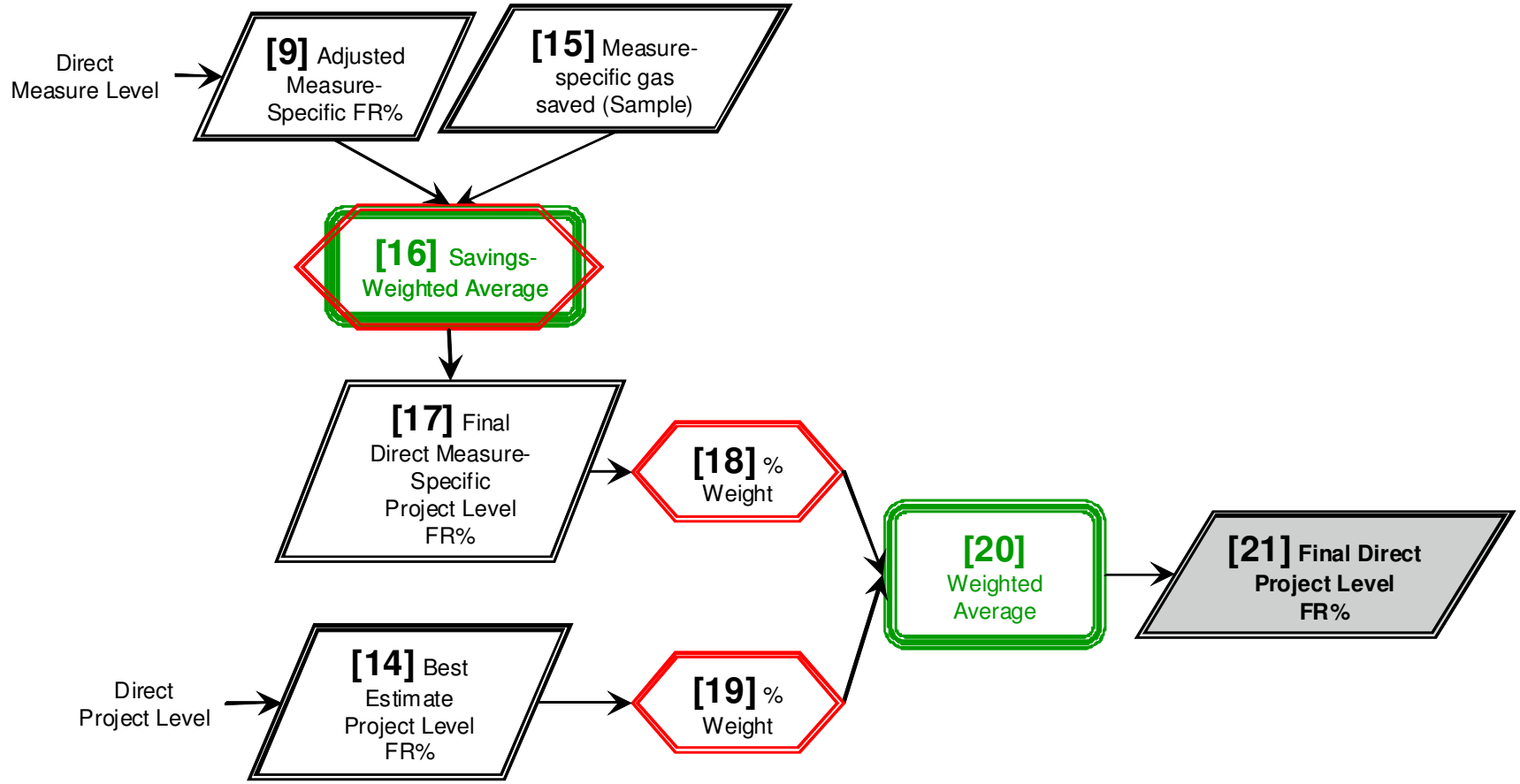
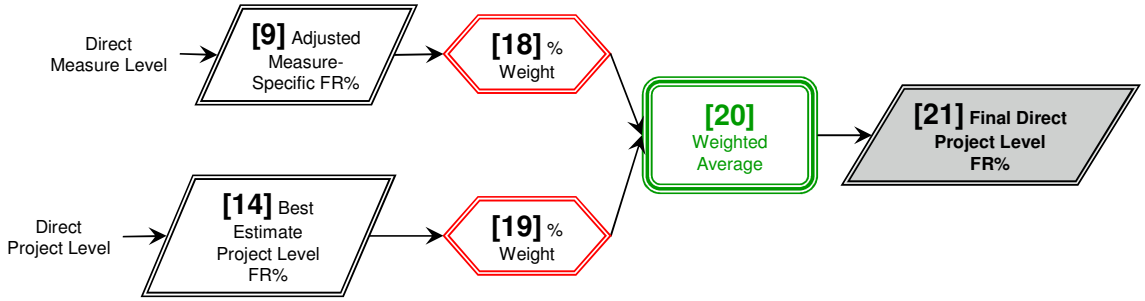
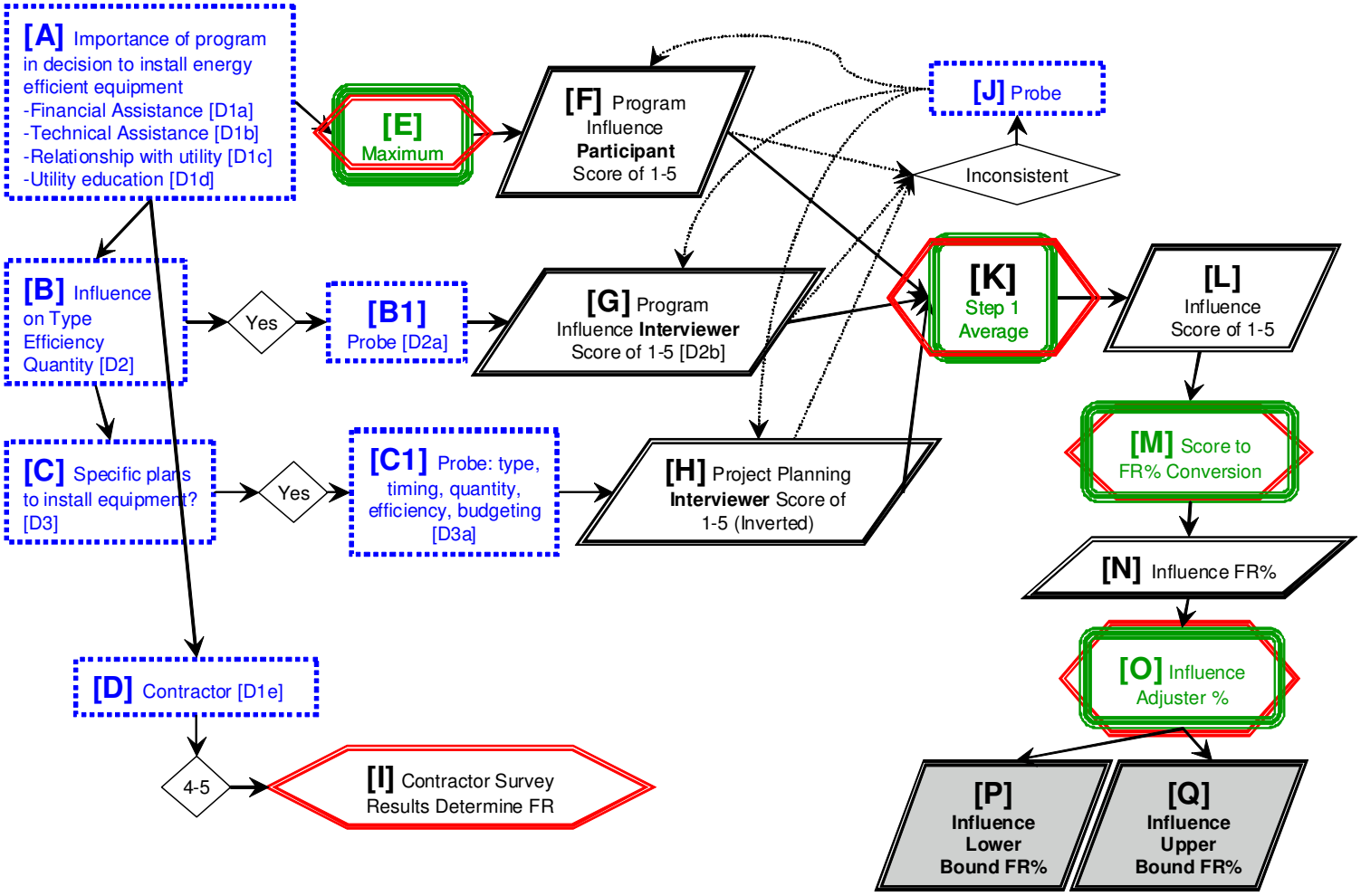


Figure 6. Free Ridership Analysis – Direct, Combined Project Level – Revised



Changes: Measure-specific gas savings values were not available so [9] fed straight through to [18].

Figure 7. Free Ridership Analysis – Program Influence, Project Level



Changes: Boxes [O], [P], and [Q] were deleted. See discussion on the following pages.

Figure 8. Free Ridership Analysis – Combined Direct and Program Influence Results - Original

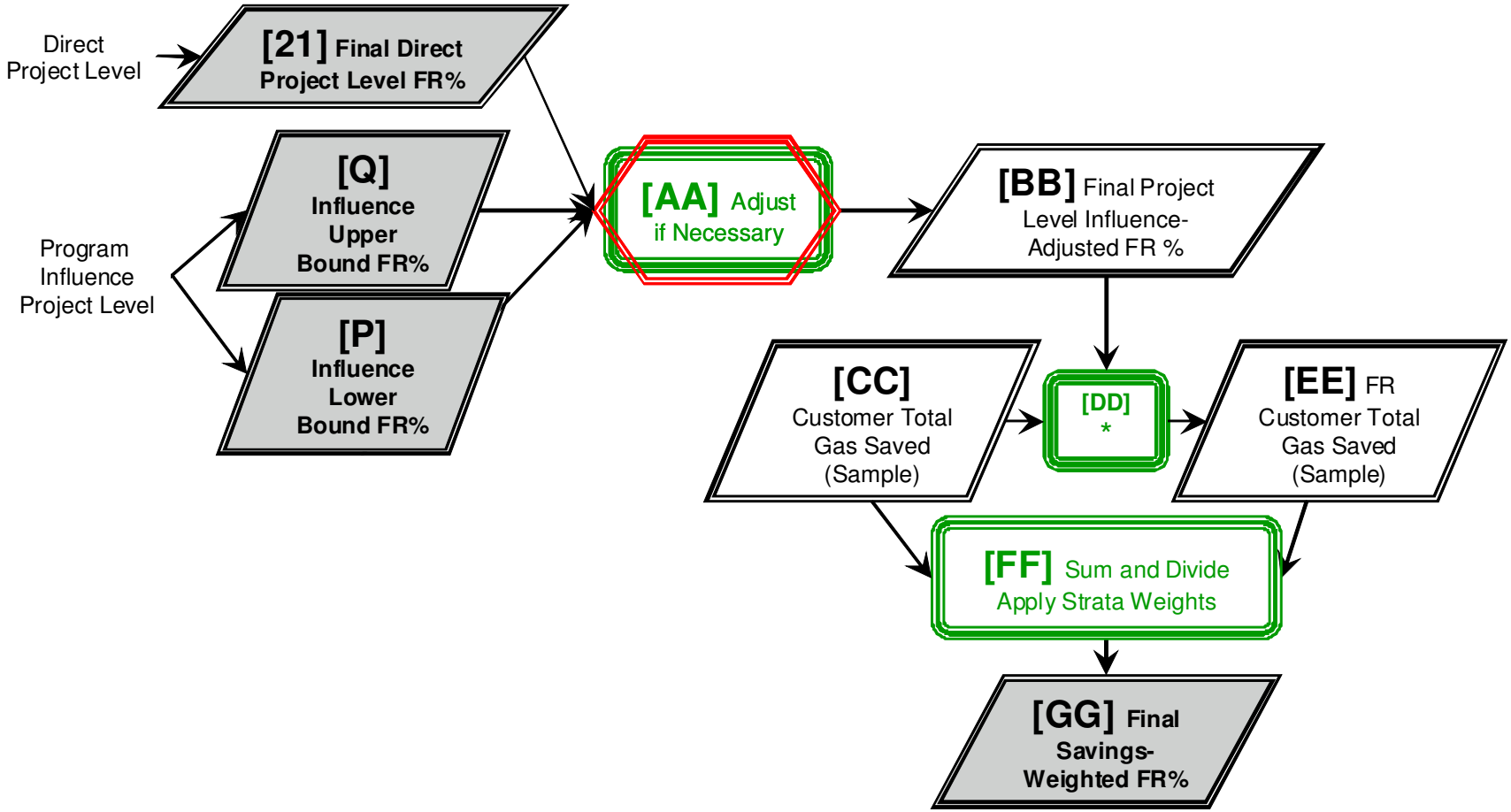
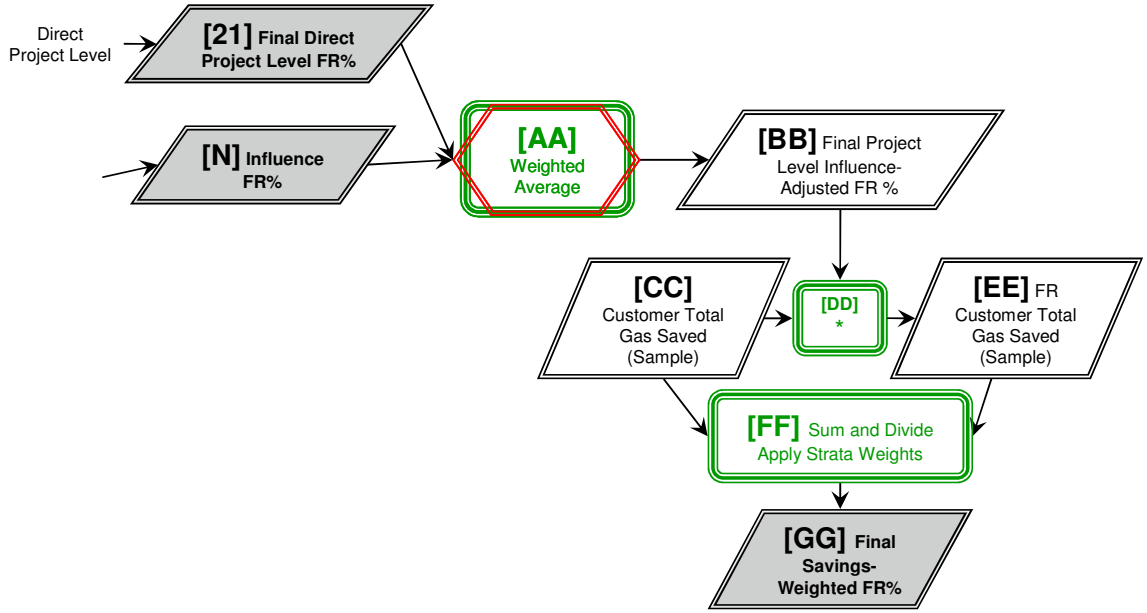


Figure 8. Free Ridership Analysis – Combined Direct and Program Influence Results - Revised



Changes: Because [21] was almost always significantly different from [N], the influence upper [Q] and lower bounds [P] had to be very wide to incorporate [21], which gave too much weight to [N]. It was decided that a more appropriate approach was to average [21] and [N].

Participant and Trade Ally Survey Sample Design

The budget for this study is designed to produce results at 90% confidence level at +/- 20% precision at the segment level with five segments per utility and 90% confidence level at +/- 10% precision at the utility level. The budget is based on the assumption that we will complete 17 surveys per segment per utility, covering a total of 170 projects. Since the total number of surveys that would be completed at 90/20 precision with 5 segments is more than that needed to produce 90/10 precision at the utility level, the budget should be sufficient to produce both 90/20 precision at the segment level and 90/10 precision at the utility level. Some extra surveys may be needed in certain segments to improve the fit of the sample to the utility-level population to produce 90/10 results.

We will on occasion complete more than one survey per project if we need to talk to both the end user and the contractor. The survey costs assume we will complete an average of 1.3 surveys per project.

Segments

Enbridge and Union agreed to the following definitions of the segments that should be included in the sample:

- Industrial
- Agriculture
- New Construction
- Commercial
- Multifamily (Multifamily is also referred to as "multi-residential".)

Enbridge provides design assistance and a holistic approach to all new construction projects in commercial and multifamily buildings. As a result, it includes new construction projects in those sectors in a "New Construction" category. For all other sectors, energy savings claimed typically refer only to mechanical upgrades related to the new facility and so are grouped with retrofit projects in their sector.[4]

Sample Size within Segments

It may be that the optimal sample distribution is not simply to do a random distribution from among the participants in each segment. There are two issues to consider. First the available population, second the size of individual projects relative to the population.

Sample compared to population size. It appears that there are enough participants in each segment to complete 17 surveys per segment with the exception of the Agriculture and New Construction segments for Union (Table 3). There are 18 individual agriculture customers and only five new construction customers. We will attempt to interview all Union participants in those segments (and will stop if we get 17 in agriculture). We can distribute the 12 completes that cannot be obtained in the Union new construction segment to other segments.

[4] Source: Judith Ramsay email 10/23/2007.

Table 3. Sample Size as Percent of Population

	Individual customers/ decision makers		17 Completes as % of Population	
	Union	Enbridge	Union	Enbridge
Industrial	67	76	25%	22%
Agriculture	18	32	**94%**	53%
Multi-family	29	187	59%	9%
New Construction	5	52	**340%**	33%
Building Retrofit	94	105	18%	16%

Source: Derived from spreadsheet sent by Christine Zivanov October 10, 2007.

If the population is not large, a small population correction factor is typically used to reduce the needed sample size,[5] e.g., if the population in a targeted group is 100, the sample size to achieve 90/10 precision is reduced to 40. For 90/20 precision, the small population correction factor comes into effect for populations of 170 or smaller, which covers all but one segment, Enbridge multifamily projects. The required sample size to reach 90/20 by segment, after applying the small population correction factor is shown in Table 4, which shows a total of 124 surveys. Given a budget based on 170 completes we could potentially distribute 46 surveys (170-124=46) to address other issues (we will return to this below).

Table 4. Sample Sizes Adjusted for Small Population

Segment	Utility	Population Size	Adjusted Sample Size
New Building	Union	5	4
Agriculture	Union	18	9
Multi-family	Union	29	11
Agriculture	Enbridge	32	12
New Building	Enbridge	52	13
Large Industrial	Union	67	14
Large Industrial	Enbridge	76	14
Building Retrofit	Union	94	15
Building Retrofit	Enbridge	105	15
Multi-family	Enbridge	187	17
Total			*124*

Source: Population size from spreadsheet sent by Christine Zivanov October 10, 2007.

Size of individual projects relative to the population. One common approach to sampling for DSM program evaluations is to stratify the sample to ensure that many of the participants with the highest energy savings are included. This reduces the variance among respondents within each stratum and results in a greater overall precision in estimating the share of energy savings that could be considered free

[5] When the sample size exceeds 1/10th of the population size, then the sample size is calculated as (Sample Size)/((Sample Size)/(Population Size)+1).

riders. This is the approach that will be taken for this analysis, basing the segmentation only on gas savings, without regard to water or electricity savings or the TRC.

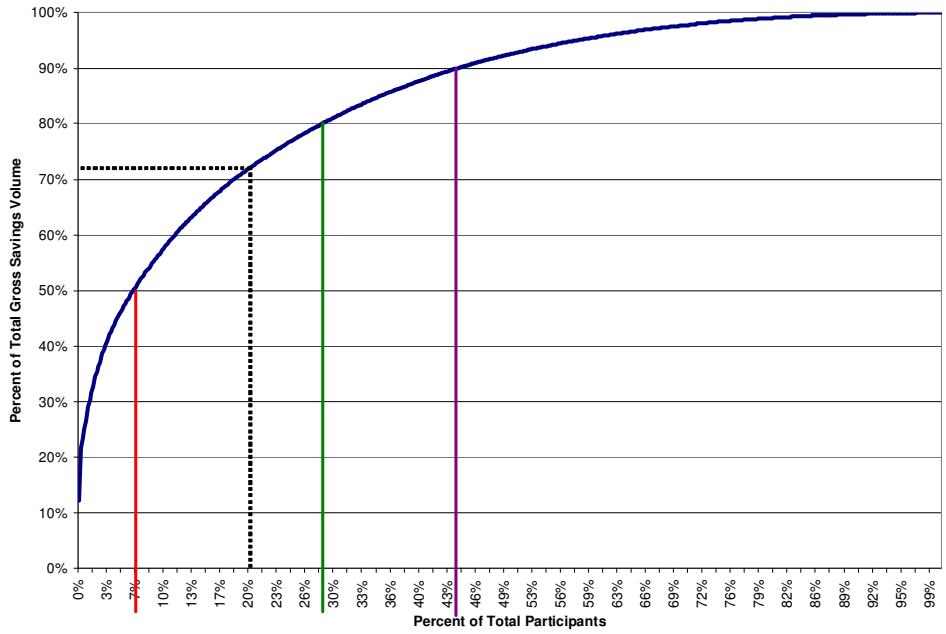
One half of the savings reported by Enbridge from the last quarter of 2006 and the first three quarters of 2007 was achieved by 6.4% of the participants, the largest 20% of projects represent 72% of the program savings, and the top 44% of participants represent 90% of the savings (Table 5 and Figure 9). Given this distribution, it seems appropriate to segment the sample by savings.

Table 5. Participants' Share of Savings – Enbridge

Percent of Participants	Percent of Gross m^3
6.4%	50%
20.0%	72%
22.8%	75%
28.2%	80%
44.0%	90%

Interpretation: 6.4 Percent of the participants account for 50% of the gross savings volume.
Source: Derived from spreadsheet sent by Judith Ramsay October 09, 2007.

Figure 9. Participants' Share of Savings – Enbridge



Source: Derived from spreadsheet sent by Judith Ramsay October 09, 2007.

One approach to segmenting the sample by savings would be to sample with certainty the customers responsible for the most savings within each segment. Table 6 shows the percent of segment savings for Enbridge projects of the five projects with the largest savings within each segment. In three of the segments, the top five projects represent over 40% of the savings. Since this represents a fairly large

percent of the savings, this supports the decision to sample the top five projects in each segment for each utility with certainty and the remaining sample should be picked at random from the remainder.

Table 6. Percent of Savings from Top 5 Projects

	Total Gross m^3			Percent of Segment Total		
Segment	Top 5 Projects	Remainder	Total	Top 5 Projects	Remainder	Total
Industrial	24,066,050	26,646,410	50,712,460	47%	53%	100%
Agriculture	1,900,331	2,588,866	4,489,197	42%	58%	100%
Multifamily	1,917,380	21,570,252	23,487,632	8%	92%	100%
New Construction	1,023,733	3,061,981	4,085,714	25%	75%	100%
Commercial	5,771,444	8,124,495	13,895,939	42%	58%	100%
Total	34,678,938	61,992,004	96,670,942	36%	64%	100%

Source: Derived from spreadsheet sent by Judith Ramsay October 09, 2007.

PARTICIPANT AND TRADE ALLY SURVEY – SPILLOVER

This section will outline the survey and analysis approach for the participant survey, covering the spillover aspect. The spillover questions will be incorporated in the participants and trade ally surveys described above and the spillover analysis will be implemented in concert with the free ridership analysis.

Survey Overview

Spillover represents energy savings that are due to the program but not counted in program records. Spillover can be broken out in three ways:

- **Participant inside spillover** represents energy savings from other measures taken by participants at participating sites not included in the program but directly attributable to the influence of the program.
- **Participant outside spillover** represents energy savings from measures taken by participants at non-participating sites not included in the program but directly attributable to the influence of the program.
- **Non-participant spillover** represents energy savings from measures that were taken by non-participating customers but are directly attributable to the influence of the program. Non-participant spillover is sometimes called the "Free-Driver effect."[6]

Summit Blue will estimate **participant inside and outside spillover** through questions in the participant and trade ally surveys and through the Audit-Only Survey. Summit Blue will estimate nonparticipant spillover through the nonparticipant survey.

[6] See for example California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals. TecMarket Works. Prepared for the California Public Utilities Commission. April 2006. Page 226.

Participant Inside Spillover

Respondents are asked whether their experience with the programs caused them to install additional energy efficient equipment at the site that did not go through the program. This establishes whether inside spillover exists. For those respondents reporting that additional measures were installed, they are asked to identify in which year(s) the measures were installed, and to describe how the program influenced their decisions to install additional energy efficient equipment at their facility. An additional question is asked to determine the ratio of the savings from these additional measures compared to the savings from the measures installed under the program. That is, they are asked the percent of savings as a multiple of the savings achieved under the program (**savings multiplier**). Finally, respondents are asked to estimate the share of the savings from these additional measures that can "reasonably be attributed to the influence" of the program **(net-to-gross percentage)**. The process of breaking the questions into incremental steps helps the respondent think through each part, and it allows the respondent to provide his or her expert judgment as a participant in the target market.

Participant Outside Spillover

Similar to inside spillover, respondents are asked first whether the influence of the program caused them to install any additional energy efficiency equipment, outside of the program, at other sites beyond what they would have done without their experience with the program. If they respond yes, they are asked several follow-up questions designed to provide an estimate of the level of savings from these actions that could be attributed to the program. These questions address the following:

- The number of non-program-funded facilities at which these extra installations occurred.
- How the program has influenced their decisions to install the high efficiency equipment at other facilities.
- The savings—per site—from the additional measures relative to the savings from the participating project being discussed in the interview.
- The share of the savings that can reasonably be attributed to the program's influence.

Using the Participant and Trade Ally Survey Responses to Estimate Spillover

Participant Inside Spillover

Inside spillover is zero for those without additional measures (or those who failed to answer all of the questions), and it is the product of the savings multiplier and the net-to-gross percentage for those with inside spillover. Similar to the free ridership analysis, individual spillover estimates are weighted both by relative energy savings for each respondent, as well as by sample stratification to determine an inside spillover value for the group as a whole.

Participant Outside Spillover

The savings as a percent of the in-project measure is multiplied by the share of savings attributed to the program to calculate the outside spillover value.[7] Similar to the free ridership analysis, individual spillover estimates are weighted both by relative energy savings for each respondent, as well as by sample stratification to determine an outside spillover value for the group as a whole.

AUDIT-ONLY SURVEY

This section will outline the survey, analysis approach, and sample design for the Audit-Only Participant survey.

Survey Overview

Participants who received an audit, implemented a recommended measure, but did not receive incentives through the program for that measure can be considered spillover. These kinds of participants would not be included in either the participant or nonparticipant surveys discussed above and below. We will implement a survey specifically with this population and focusing solely on spillover measures to provide an important additional estimate of program spillover.

The interviewer will begin by asking the respondent if they recall receiving the audit. If they do not, the interviewer will attempt to speak to someone else who might recall the audit.

The interviewer will ask the participant about each measure recommended in the audit. (Although we will limit this to the measures with the largest savings if there are more than 5 measures recommended.) The interviewer will examine whether the respondent remembers the recommendation and whether it has been installed and when. If the participant installed a measure, the interviewer will ask the following:

> 1. On a scale of 1 to 5 where 1 is “no influence” and 5 is “a great deal of influence”, how much influence did the audit have in your decision to implement this measure?
>
> 2. What share of the savings from this measure can reasonably be attributed to the influence of the program?

During the survey, the interviewer will fill in a matrix approximately like the following.

[7] A cap of five outside spillover projects per respondent is used to prevent outliers from skewing the results.

Table 7. Audit Survey Question Matrix

Recommended Measure Description	Recall recom-mended?	Measure installed?	% of Measures	% of Savings	When was it installed?	Influence of Program	Share of Savings
1. [Data]	Y/N	Y/N/DK	%	%	Month, Year	1 2 3 4 5	%
2. [Data]	Y/N	Y/N/DK	%	%	Month, Year	1 2 3 4 5	%
3. [Date]	Y/N	Y/N/DK	%	%	Month, Year	1 2 3 4 5	%
4. [Date]	Y/N	Y/N/DK	%	%	Month, Year	1 2 3 4 5	%
5. [Date]	Y/N	Y/N/DK	%	%	Month, Year	1 2 3 4 5	%

Using the Audit-Only Survey Responses to Estimate Spillover

The analysis of audit-related spillover savings will be fairly straightforward. The program tracking data will have measure-specific savings estimates from the audit. In general form, the participant-level spillover calculation will be:

> Spillover Multiplier = (Influence of Program {converted to percentage} + Share of Savings)/2
>
> Participant-level spillover = (Savings Estimate *{from sample}*) * (Spillover Multiplier) * (Percent of Items that were recommended that were installed)

This amounts to ***<averaging>*** the converted influence score with the answers to the share of savings question. Converting the influence of the program score to a percentage will be done using the scale shown in Table 8 below.

Table 8. Translate Influence Score to Free Ridership Percentage *<Assumptions>*

Average Influence Score	1.00	2.00	3.00	4.00	5.00
Influence Percentage	0%	25%	50%	75%	100%

Calculating program level savings will require weighting respondents and scaling up to the population.

Audit-Only Survey Sample Design

The sample will be taken from customers who had audits in 2005. This provides the optimal balance between providing enough time for the customers to have acted on the recommendations in the audit and ensuring that the audit is not so far in the past that respondents have trouble recalling details of the recommendations. Because the sample will be based on a single year, the result of the analysis can be expressed in spillover per year. Given that there have not been any significant changes in the program strategy, spillover calculated from a prior year ought to reasonably represent the probable spillover from the current year.

The costs of implementing the Audit-Only survey are based on these assumptions:

1. The survey would be done over the phone
2. Enbridge and Union provide the sample

3. Program tracking records provide estimates of savings for measures that get counted as spillover.
4. Completing 67 surveys for each utility to provide 90/10 precision at the utility level

Enbridge and Union will provide customer-level data from their program tracking systems that describes customers who have had audits in 2005 but have not implemented measures that appear in their program tracking systems. However, Union Gas was unable to find any companies who had an audit in 2005 and had not implemented one of the recommended measures through the program. As a result, no audit-only surveys were attempted with Union Gas customers. Based on the relatively limited sample available, Summit Blue will survey all available sample.

NONPARTICIPANT SPILLOVER SURVEY

This section will outline the survey, analysis approach, and sample design for the nonparticipant spillover survey.

Survey Overview

Summit Blue will estimate nonparticipant spillover using a survey targeted at nonparticipants only. The approach will be similar to participant spillover as follows:

- Whether spillover may exist. Using yes/no questions ask whether the respondent installed energy efficiency equipment.
- The amount of savings per spillover project. Asking respondents to estimate the energy savings associated with the implemented measures.
- The share of those savings that could be attributed to the influence of the program.

The approach to determine program influence will parallel that taken to determine free ridership – determining how much influence the program had on the decision to implement the measure.

The largest challenge in a nonparticipant spillover survey is identifying an appropriate sample and reaching a person within each company who can and will address the relevant issues. Using Enbridge and Union customer data we will identify a sample that would be reasonably close to the participant population then implement a phone survey in the following sequence:

1. Find someone knowledgeable about the replaced or modified equipment.

2. Aware of the program? If no, terminate.

3. Did the company participate in the program in the past 3 years? If yes, terminate.

4. Has the company modified or installed equipment that might fall under the program's incentives? (List target equipment.) If no, terminate. If yes, when?

5. Determine what effect, if any, the program had on their decision. (Same questions as in the Audit-Only survey.)

5A. On a scale of 1 to 5 where 1 is "no influence" and 5 is "a great deal of influence", how much influence did the program have in your decision to install or modify your equipment?

5B. What share of the savings from this change can reasonably be attributed to the influence of the program?

5C. On a scale of 1 to 5 where 1 is "no influence" and 5 is "a great deal of influence", how much influence did **your suppliers or contractors** have in your decision to install or modify your equipment?

5D. If ***<5A > 2 or 5B > 30%>*** then: "We want to have one of our engineers follow up with you to ask some technical questions. Will that be OK?

6. If 5D=Yes. Quantify the magnitude of savings. Summit Blue engineer calls to ask enough questions about the equipment to make an engineering estimate of the energy savings it produces.

Because a large number of companies may be screened out in the first four steps, it is most cost-effective to implement this kind of survey over the phone. The costs are driven more by locating a company and person able to get to step 5 than by the asking the questions that come in step 5. However, costs can also be significant in step 6, if detailed questions and engineering calculations are needed to calculate savings for each measure that was influenced by the program.

Using the Nonparticipant Survey Responses to Estimate Spillover

As described above, if the company indicates that it implemented measures that were influenced by the program, then a Summit Blue engineer will call to ask enough questions to estimate the measure's energy savings. With that done, the calculation of spillover parallels that for the Audit-Only survey, as follows.

> Nonparticipant spillover = (Engineering-based Savings Estimate) * (Spillover Multiplier *{calculated from survey}*)

The Multiplier is calculated in the same way as the Audit-Only multiplier.

Nonparticipant Sample Design

The project budget assumes that we will implement a minimum of 670 screening surveys across both utilities but cannot guarantee a specific number of respondents getting through to step 6. In theory, completing 67 screening surveys with companies who have made appropriate equipment purchases or changes that could have been influenced by the program would provide 90/10 precision for an estimate of whether spillover happened (again across both utilities). If the incidence of spillover is small, it would not provide a very robust estimate of the therm value of that spillover. We based the budget on an assumption that 10 screening calls are needed to complete 1 call through step 5, thus requiring 670 screening calls. If the 1/10 ratio is low, then we will spend relatively more money on engineering calls and reviews. If it is high, then we will complete relatively more screening surveys. We will complete as many screening calls and engineering reviews as the budget will allow.

The sample will be done at random after eliminating customers in the small commercial rate class. This will target the sample at the segment most likely to have been influenced by the program and allow a simple extrapolation to the population. Summit Blue staff will advise utility staff on the best approaches to drawing a random sample from their data.

OUTLINE OF FINAL REPORT

The following is a preliminary outline of the final report presented to start a dialog about how the report should be structured.

1. Executive Summary
    a) Top-Level Results
    b) Program-Wide Free Ridership
    c) Segment-Level Free Ridership
    d) Role of Prior Program Experience
    e) Spillover
    f) Net-to-Gross Ratio
2. Introduction
    a) Definitions
    b) Report Contents
3. History and Critique of Free Ridership Methodologies
4. Summary of Analysis Methodology
    a) Estimating Free Ridership
    b) Estimating Spillover
5. Sampling and Data Collection
6. Findings
    a) Free Ridership Results
        i) Direct Free Ridership Estimates
        ii) Program Influence Questions
        iii) Adjusted Free Ridership Estimates
        iv) Role of Prior Program Experience
    b) Spillover Results
    c) Net-to-Gross Ratio
7. Conclusions

Appendix A: Methodology Detail—Estimating Free Ridership and Spillover
Appendix B: Survey Instruments

Appendix B. Surveys

Contents

1. CUSTOM PROJECTS PARTICIPANT SURVEY

1.1 CONVENTIONS

- Bold text is spoken.
- Italics text is instructions for the interviewer.
- *{VIP}* indicates questions that are particularly important and represent specific boxes in the analysis flow chart.

1.2 SAMPLE DATA

(NOTE: Projects are the survey unit, so each project to be interviewed separately. Thus, use separate form for each Project, even if the same interviewee is associated with multiple projects)

Name_____ Interviewer Initials _____

Firm Name _____ Survey Date _____

Address _____ Sample ID # _____

Phone Number _____ Project ID #_____

Project Completion Date_____

Equipment installed: _____
Channel Partner involved: _____
Program activity: _____

2.2. Project Briefing Information – Union Gas sales/marketing staff input:

2.2.1. Month/year of initial Union Gas involvement with the project or its precursors

2.2.1a Month_____

2.2.1b Year_____

2.2.2. General context of Union Gas relationship with customer:

a. Historical education effort with customer on efficiency opportunities & Union Gas programs (high, medium, low level of effort):

_____

_____

b. Facility energy audits performed (steam traps, boilers, etc)

_____

_____

c. Distribution and merchant services support provided (general credibility & relationship building)

_____

_____

d. Other (describe) _____

_____

_____

2.2.3. Services provided to customer in project-related contacts:

a. Gas bill histories (usage, cost) _____

b. Approximate number of project-related contacts with customer _____

c. General information on program _____

_____

_____

d. Project-specific technical information or analysis: technical/engineering, financial, vendor/technology alternatives, etc.

_____

_____

e. Project/technology recommendations _____

_____

_____

f. Other (describe) _____

_____

_____

ga. Low/medium/high intensity of support to customer generally

_____

_____

gb. Low/medium/high intensity of support to project specifically

_____

_____

h. Low/medium/high effect of on project's efficiency level

_____

_____

1.3 IDENTIFY CORRECT RESPONDENT

[Note: These questions may be covered on the phone while setting up an appointment.]

A1. Are you the most appropriate person to talk to about the decision to install that equipment and about the selection of the specific energy efficiency equipment?

1. YES Continue to Question A3

2. NO ➔ "May I ask who would be the best person to talk to?"
   [obtain names and phone numbers] _____
   _____
   _____
   [Ask to speak with this person. Start again at the beginning.]
3. DO NOT REMEMBER PROJECT ➔ Ask Question A2

A2. Do you recall participating in <u>any</u> programs through Union Gas/Enbridge Gas Distribution in the past few years regarding this location?

1. YES
   A2A. Did the program involve assistance from Union Gas/Enbridge Gas Distribution in identifying energy efficient equipment or process changes and financing toward the initial capital costs?
   1. YES *Continue to Question A3*
   2. NO➔ "Can you provide me…" *[See text for "NO" above]*
2. NO ➔ "Can you provide me with a contact name and phone number for a person who might be familiar with the work that was done?" *[Get contact information and call this person; Start again at the beginning.]*

[If they express hesitation, use an appropriate combination of the following.]
Confidentiality. We are an independent research firm and will not report your individual responses in any way that would reveal your identity, as your response only will be presented in aggregate along with responses from other survey participants.
Security. Your responses will not affect your ability to participate in the program in the future.
Sales concern. I am not selling anything. I simply want to understand what factors were important to your company when deciding to install energy efficient equipment with assistance from this program.
Contact. If you would like to talk with someone about this effort from
–Union Gas, you can call your account manager.
–Enbridge Gas Distribution, the Enbridge Industrial contact is Peter Goldman at 416-495-6348, the Enbridge Commercial contact is Stefan Surdu at 416-495-5917, or you may contact your Energy Solutions Consultant.

1.4 CONFIRMATION OF EQUIPMENT INSTALLED

B1. Prior to calling, review program records for the project. In Table 1 below under "Program Records," check off each measure category for which energy efficient equipment was installed.

B2. Just to make sure that we're talking about the same project, I show that you installed *[list major equipment or equipment categories]***. To your recollection, was all this equipment installed?**
[Check off each category for which respondent recalls installing equipment. If information is not available from program records, ask the respondent to recall what measures were undertaken.]

B3. Did Union Gas/Enbridge Gas Distribution provide financial assistance for installing this equipment?
[Ask of only those checked in B2. Check off each category for which respondent recalls that Union Gas/Enbridge Gas Distribution provided financial assistance.]

B3b. Approximately how much was the incentive as a percent of the total project cost?
[Ask of only those checked in B3.]

B4. Did you receive any technical assistance from Union Gas/Enbridge Gas Distribution staff with any of this equipment?
[Ask of only those checked in B2. Check off each category for which respondent recalls that Union Gas/Enbridge Gas Distribution provided technical assistance for the measure.]

Table 1. Equipment in program records and recalled by respondent

[Check if Yes]

Measure Category	**B1.** Program Records	**B2.** Respondent Recollection	**B3.** Union Gas/Enbridge Gas Financial Assistance	**B3b.** Incentive as % of Project Cost	**B4.** Union Gas/Enbridge Gas Distribution Technical Assistance	Notes/Caveats
a. Machine/Process	❒	❒	❒	%	❒	
b. HVAC (incl. furnaces, all boilers, A/Cs, chillers, EMS, etc.)	❒	❒	❒	%	❒	
c. Lighting	❒	❒	❒	%	❒	
d Controls (boiler controls, variable frequency drive controls	❒	❒	❒	%	❒	
e. Building envelope (incl. insulation, windows)	❒	❒	❒	%	❒	
f. Domestic hot water	❒	❒	❒	%	❒	
g. Refrigeration	❒	❒	❒	%	❒	
h. Agriculture	❒	❒	❒	%	❒	
i. Converted equipment from electricity to gas (fuel substitution)	❒	❒	❒	%	❒	
j. Other: _____	❒	❒	❒	%	❒	

1.5 SET THE CONTEXT

C1. Prior to the project being discussed, did your organization have a general policy regarding the energy efficiency specification of projects involving new construction and equipment retrofits, replacements or building remodeling generally?
1. Yes 2. No -8. Do not know -9. Refused

C2. [If yes] Did your policy target a specific standard of efficiency levels?
1. Yes 2. No -8. Do not know -9. Refused

C2a. [If yes] Can you specify what those efficiency levels are?
-8. Do not know -9. Refused

C3. Since the project, has your energy efficiency policy changed
1. Yes 2. No -8. Do not know -9. Refused

C4. [If Yes] How?

_____

C5. Does your organization have specific criteria for selecting energy efficient equipment based on payback periods, life cycle costs, or internal rate of return?
1. Yes 2. No -8. Do not know -9. Refused

C6. [If C5=1 (yes)] Which?
1. Simple payback period
2. Life-cycle cost analysis
3. Internal rate of return
4. Other [Record verbatim] C6B. _____

-8. Don't know
-9. Refused

C7. [If C6=1 (simple payback period)] How many years or less must the project payback be?
-8. Do not know -9. Refused

C8. [If C6=2 (internal rate of return)] What is the minimum percent rate of return required for energy-efficiency related projects? [Record 10% as "10" not "0.10"]
-8. Do not know -9. Refused

C9. What was simple payback period for this project <u>prior</u> to any financial assistance from Enbridge/Union?
-8. Do not know -9. Refused

C10. What was simple payback period for this project <u>after</u> financial assistance from Enbridge/Union? *{VIP}*
-8. Do not know -9. Refused

C11. [Note other relevant comments about how payback period figured in the decision process.]

_____

C12. Do you recall receiving energy efficiency information and training in any of the following areas that was sponsored or delivered by Union Gas/Enbridge Gas Distribution?
1. Yes 2. No -8. Do not know -9. Refused

C12a. General energy efficiency information
C12b. Energy audits
C12c. Technology seminars (including those co-sponsored with trades)
C12d. Program information
C12e. Specific project identification

1.6 FREE RIDERSHIP BATTERY

1.1.1 Program Influences

[Ask Questions in this section for all the equipment installed in aggregate.]

I'm going to ask a few more questions about the influence of Enbridge Gas Distribution/Union Gas on your decisions to install high efficiency equipment.

D1. On a scale of 1 to 5, where 1 = "not at all important" and 5 = "very important"…
Please indicate how important each of the following aspects of your experience with [Enbridge/Union] were in your decision to install energy efficient equipment at your facility?
{*VIP*}

D1a.	**Financial assistance**	**1**	**2**	**3**	**4**	**5**	**DK** **Refused**
D1b.	**Project technical assistance**	**1**	**2**	**3**	**4**	**5**	**DK** **Refused**
D1c.	**Your ongoing relationship with the utility**	**1**	**2**	**3**	**4**	**5**	**DK** **Refused**
	(Providing impartial advice and facilitating unbiased contacts, e.g., business partners)						
D1d.	**Utility education activities**	**1**	**2**	**3**	**4**	**5**	**DK** **Refused**
	(e.g., case studies, best practice information, training, seminars, conferences, trade shows)						
D1e.	**Advice and assistance from a contractor**	**1**	**2**	**3**	**4**	**5**	**DK** **Refused**

D1e1. [If D1e>3] Who was that contractor?

D1e2. [If D1e>3] May I have the name and phone number of your main contact there?

D2. Did the assistance you received from [Enbridge/Union] in any way influence the <u>type</u> or <u>efficiency level</u> of the equipment or the <u>amount</u> of high efficiency equipment you installed or process changes implemented?

1 Yes ➔ *Continue to Question D2a*
2 No (all the same equipment would have been installed at the same high efficiencies) ➔ *Skip to Question D3*
-8 Don't know ➔ *Skip to Question D3*
-9 Refused➔ *Skip to Question D3*

D2a. In what ways did the assistance you received from [Enbridge/Union] change your plans or in any other way influence your decision to install energy efficient equipment. Be sure to identify specific equipment.

_____

D2b. ***[Based on response to D2a, fill in a "1 to 5"score indicating the extent to which the program influenced the decision to install energy efficient equipment. DO NOT ASK RESPONDENT DIRECTLY. "1" indicates that the program had no influence; "5" indicates that the program was the primary reason that energy efficient equipment was installed.]***
{VIP}

(No program influence) 1 2 3 4 5 (Program was primary influence)

D3. **Did your company have specific plans to install <u>any</u> of the** *[list <u>all</u> relevant measure categories]* **equipment prior to your first contact with [Enbridge/Union] staff regarding this project?**
1 Yes ➔ *Continue to Question D3a*
2 No ➔ *Skip to Next Section*
-8 Don't know ➔ *Skip to Next Section*
-9 Refused➔ *Skip to Next Section*

D3a. Please describe any plans that you had to install the equipment prior to receiving assistance you received from [Enbridge/Union].
[Interviewer note: the goal here is to understand the plans that were in place before being influenced by program. Probe for equipment type, timing, quantity, and efficiency, as well as prior budgeting. Attempt to elicit responses that will provide answers for the "likelihood" or "share of savings" questions (E2a and E2b).]

D3b. *[Based on responses to D3a, fill in a "1 to 5"score indicating the extent to which respondent was already planning to install the energy efficient equipment. DO NOT ASK RESPONDENT DIRECTLY. "1" indicates that respondent had no plans at all; "5" indicates that respondent had documented plans and had budgeted for all of the efficient equipment.]* ***{VIP}***

(No plans) 1 2 3 4 5 (Documented plans/budget)

1.1.2 Direct Decision Making Questions

[Ask the following questions <u>for each measure category</u> checked under Question B2 in Table 1 above. If previous open-ended questions have provided the necessary information, interviewer may skip the question/measure category. By the end of the interview, interviewer should be able to <u>populate Table 2</u> below with EITHER a "likelihood" OR a "share of equipment" OR both, for each relevant measure category.]

Now I'd like to try to quantify the impact of the [Enbridge/Union] assistance. I'd like you to think about the energy savings you achieved with the equipment you replaced. Some of the savings may have come from just replacing old equipment with <u>any</u> new equipment *[as appropriate: or replacing your existing process with a new process]***. And some of the savings may have come from the fact that the equipment you installed was more efficient than standard new equipment. I'd like you to think about the utility's influence on this last type of savings.**

First, let me ask about the _____*[MEASURE CATEGORY]***.**

E1. If you had not received assistance you received from [Enbridge/Union] , would you have replaced your existing _____ *[MEASURE CATEGORY]* or installed new equipment in the foreseeable future? ***{VIP}***

[Note that these do not have to be "energy efficient" equipment.]

1 Yes ➔ *Continue to Question E1a*
2 No ➔ *ENTER 0% for the category in the Free Ridership Value column in Table 2 below (E2c) and move on to the next measure category.*
-8 Don't know ➔ Probe, perhaps using *Question E1a*
-9 Refused➔ *Skip to next measure category*

E1a. When would you likely have made these investments if you had not received assistance from [Enbridge/Union]? *[If clarification needed:]* (Within how many months or years of when you participated in the program?) ***{VIP}***

E1aM. _____ Months
E1aY. _____ Years
-8 Don't know ➔ Probe, perhaps using *Question E1a*
-9 Refused➔ *Skip to next measure category*

- *Fill in only for categories for which equipment has been installed.*
- *Enter "0" years if equipment would have been installed in the same timeframe regardless of program participation.*
- *If respondent says, "…in a year or two," enter "1.5" years.*
- *Based on earlier responses, ask either the "likelihood" question below or the "share of equipment" question, whichever is more appropriate.*
- *For example, if respondent installed a single chiller, then the "likelihood" question may be most appropriate; if they installed multiple measures of various types/sizes, then the "share of equipment" may be more appropriate. Some respondents may be able to offer valid responses to both questions.*
- *If you are uncertain, ask both questions. If respondent can provide a response to each, then record both responses.*

E2a. *[Likelihood]* What is the likelihood that you would have installed the same or similar _____ *[MEASURE CATEGORY]* of the <u>same level of energy efficiency</u> if it had not been for the assistance you received from [Enbridge/Union]? ***{VIP}***

1 Definitely would NOT have installed equipment of the same level of energy efficiency
2 Definitely WOULD have installed equipment of the same level of energy efficiency anyway
3 MAY HAVE installed equipment of the same level of energy efficiency, even without the program
E2a2.About what percent likelihood? _____%
-8 Don't know
-9 Refused

E2b. *[Share of equipment]* (Or, if you might have installed some but not all of the _____ *[MEASURE CATEGORY]* even without the assistance you received from [Enbridge/Union] , then…) what share of the _____ *[MEASURE CATEGORY]* would you have installed anyway at the <u>same level of energy efficiency</u>? ***{VIP}***

[If necessary, or if the flow of the interview dictates, you may derive this value by asking 1) the share of equipment that would have been installed (at any efficiency) and 2) the share of installed equipment that would have been high efficiency. The value in the table below for Question E2b would be the product of these two values.]

Table 2. Equipment

[Fill in EITHER the "likelihood" value OR the "share of equipment" value OR both values for each relevant measure category.

If respondents ask for the timeframe, use the timeframe specified above in Question E1a.

Then enter the appropriate free ridership value (E2c), which will be one of the following, depending on the nature of the project and the responses:

1) *The single value for "likelihood" or "share of equipment" if only one is entered;*
2) *If value provided for both, enter either Likelihood or Share value, whichever best represents the appropriate value*
3) *The product of the two, if appropriate (e.g., if there is a 50% likelihood that 75% of the equipment would have been installed, and respondent definitely wouldn't have done the final 25%)*

Measure Category	**E1. Would have installed in foreseeable future** *[Check no or yes]* **2=No** *FR=0%*	**1=Yes** (cont.)	**E1a. Within ____ Years of participation** *[Enter # of years]*	**E2a. Likelihood that energy efficient equipment… …would have been installed without the program**		**E2b. Share of energy efficient equipment that… …would have been installed without the program**	**E2c.** *[Entered by interviewer]* **Free Ridership Value**
a.Machine/Process	❒	❒	Months Yrs	%	and/or	%	%
b. HVAC	❒	❒	Months Yrs	%	and/or	%	%
c. Controls							
d. Lighting	❒	❒	Months Yrs	%	and/or	%	%
e. Building envelope	❒	❒	Months Yrs	%	and/or	%	%
f. Domestic hot water	❒	❒	Months Yrs	%	and/or	%	%
g. Refrigeration	❒	❒	Months Yrs	%	and/or	%	%
h. Agriculture	❒	❒	Months Yrs	%	and/or	%	%
i. Fuel substitution	❒	❒	Months Yrs	%	and/or	%	%
j. Other:	❒	❒	Months Yrs	%	and/or	%	%

E2d. *[Additional notes/caveats (e.g., explaining how/why free ridership value was chosen, if necessary)]*

_____

E3. Overall, <u>across all equipment</u>, that is the entire project, how much of these <u>extra energy savings</u> would have been achieved anyway, even if you had not received assistance from [Enbridge/Union]. Please provide a lower and upper bound, and then your best estimate. {VIP}

***[If needed for clarification:]* For example, 50% means that half of the extra savings from the energy efficient equipment would have been achieved anyway. Remember, I'm asking only about the extra savings from installing energy efficient equipment instead of standard equipment.**

E3A.Lower bound ➔ _____ % E3B. Upper bound ➔ _____ % E3C. Best estimate ➔ _____ %

1.7 PARTICIPANT INSIDE SPILLOVER

Now I want to ask about whether the assistance you received from [Enbridge/Union] has influenced you to install any other energy efficient equipment that did not receive financial support from [Enbridge/Union].
[For these questions, I'm talking about all your company's participation in the program, not just since October 2006.]

G1. Did the assistance you got from [Enbridge/Union] in any way influence you to install additional energy efficient equipment <u>at this site</u> that did not get reported to the program (i.e., *equipment that would not have been installed without the influence of the program)***?**
1 Yes➔ Continue to Question G2
2 No ➔ Skip to next section
-8 Don't know ➔ Skip to next section
-9 Refused➔ Skip to next section

G2. [*If G1 = "yes"]* **What year did you install this equipment?**

G3. *[If G1 = "yes"]* **Please briefly <u>describe how</u> the assistance you received from [Enbridge/Union] has influenced your decisions to install additional energy efficient equipment at your facility.**
[Identify the types of equipment affected.]

G4. Would you estimate the energy savings from this extra equipment to be <u>less than</u>, <u>similar to</u>, or <u>more than</u> the savings from the energy efficient equipment from the original project?
1 Less than the original project ➔
G4a. About what percentage of the savings from the original project?
____% *[Enter a number <u>less than</u> 100%]*
2 About the same savings
3 More than the original project ➔
G4b. About what percentage of the savings from the original project?
____% *[Enter a number <u>greater than</u> 100%]*
-8 Don't know
-9 Refused

G5. What share of the savings from this extra equipment can reasonably be attributed to the influence of the assistance you received from [Enbridge/Union]?
_____% *[100% or less]*
-8 Don't know
-9 Refused
[Interviewer may be able to complete this based on response to G3, or at least use G3 to check for consistency. Probe if inconsistent to ensure that respondent is correctly interpreting the question.]

1.8 PARTICIPANT OUTSIDE SPILLOVER

H1. Did the assistance you received from [Enbridge/Union] in any way influence you to install any additional energy efficient equipment <u>*at other jobs or facilities in Union Gas/Enbridge Gas Distribution's Service Territory*</u> beyond what you would have done otherwise?
[Don't include projects that participated in another Union/Enbridge program.]
1 Yes ➔

H1a. How many other facilities were influenced (that did not participate in Union Gas/Enbridge Gas Distribution programs)? _____ (-8 Don't know, -9 Refused)

2 No ➔ Skip to next section
-8 Don't know ➔ Skip to next section
-9 Refused ➔ Skip to next section

H2. *[If H1 = "yes"]* **Please briefly describe how the assistance you received has influenced your decisions to install this equipment. (Probe to identify the types of equipment affected.)**

H3. On average, would you estimate the energy savings from these other non-program projects to be less than, similar to, or more than the savings from the energy efficient equipment from the program-supported that we've been discussing?
[E.g., if the same equipment was implemented in a facility twice as big, then savings would be 200%. Be sure to emphasize that this is savings "on average" not in aggregate across the many buildings that might be affected.]

1. Less than the Custom Projects project
   H3A. About what percentage of the savings from the Custom Projects project?
   ____% *[Enter a number less than 100%]*
2. About the same savings
3. More than the Custom Projects project
   H3B. About what percentage of the savings from the Custom Projects project?
   ____% *[Enter a number greater than 100%]*

-8 Don't know
-9 Refused

H4. What share of the savings from energy efficient equipment at these facilities can reasonably be attributed to the influence of the assistance you received from [Enbridge/Union]?
[Interviewer may be able to complete this based on response to H2, or at least use H2 to check for consistency. Probe if inconsistent to ensure that respondent is correctly interpreting the question.]
_____% [100% or less]
-8 Don't know
-9 Refused

1.9 FIRMOGRAPHICS

Z1. Does your company own or lease this building? :

1. Owner
2. Lease
-8. Don't know
-9. Refused

Z2. Approximately how large is the facility that received the efficiency improvements we have been talking about? (square meters)

1. Up to 5,000
2. 5,001 to 10,000
3. 10,001 to 15,000
4. 15,001 to 25,000
5. 25,001 to 50,000
6. 50,001 to 100,000
7. 100,001 to 200,000
8. 200,001 to 500,000
9. Over 500,000
-8 Do not know
-9 Refused

Z3. Is your company independent, or part of a larger organization?

1. Independent
2. Part of a larger company
3. Other Z3a. (specify) _____
-8. Don't know
-9. Refused

Z4. How old is your facility?

-8 Don't know
-9 Refused

Z5. Does your building contain any manufacturing processes?

1. Yes 2. No -8. Do not know -9. Refused

Z6a. [If yes] What type of energy do they use?

1. Natural Gas
2. Electricity
3. Other
-8 Don't know
-9 Refused

Z6b. [If yes to Z5] Have you reviewed their energy usage?

1. Yes 2. No -8. Do not know -9. Refused

Z7. How many locations does your organization have in Ontario?

1. One
2. 2 to 5
3. 6 to 10
4. 11 to 20
5. More than 20
6. Currently Unoccupied
-8. Don't know
-9. Refused

Z8. Approximately how many full time employees or full time equivalents does your organization have at your locations in Ontario?

1. Fewer than 5
2. 5 to 9
3. 10 to 19
4. 20 to 49
5. 50 to 99
6. 100 to 249
7. 250 or More
-8 Do not know
-9 Refused

Those are all the questions I had.

Z9. Do you have any final comments you would like to make?

_____

_____

Thank you very much for your time!

Z10. Record all additional or supporting comments here.

_____

_____

2. CUSTOM PROJECTS TRADE ALLY SURVEY

Business Partner (EGD) or Channel Partner (UG)

2.1 CONVENTIONS

- Bold text is spoken.
- Italics text is instructions for the interviewer.
- *{VIP}* indicates questions that are particularly important and represent specific boxes in the analysis flow chart.

2.2 SAMPLE DATA

(NOTE: Projects are the survey unit, so each project to be interviewed separately. Thus, use separate form for each Project, even if the same interviewee is associated with multiple projects)

Contact Name _____ Interviewer Initials _____

Firm Name _____ Survey Date _____

Address _____ Sample ID # _____

Phone Number _____ Project ID #_____

Project Completion Date_____

Equipment installed: _____

Customer involved: _____

2.3 INFORMATION FROM UTILITY STAFF AND RECORDS

3.1. Project Briefing Information – Union/EGD sales/marketing staff input:

3.1.1. Month/year of initial EGD/Union Gas involvement with the project or its precursors

3.1.1a Month_____

3.1.1b Year_____

3.1.2. General context of EGD/Union Gas relationship with Channel/Business Partner:

a. Historical education effort with customer on efficiency opportunities & Enbridge/Union Gas programs (high, medium, low level of effort):

_____

_____

b. Facility energy audits performed (steam traps, boilers, etc)

_____

_____

c. Distribution and merchant services support provided (general credibility & relationship building)

_____

_____

d. Other (describe)_____

_____

3.1.3. Services provided to Channel/Business Partner in project-related contacts:

a. Gas bill histories (usage, cost) _____

b. Approximate number of project-related contacts with customer _____

c. General information on program _____

_____

d. Project-specific technical information or analysis: technical/engineering, financial , vendor/technology alternatives, etc.

_____

_____

e. Project/technology recommendations _____

_____

f. Other (describe) _____

_____

3.1.4. Channel/Business Partner involvement with customer project:

a. General context of Channel/Business Partner involvement with project or its precursors

_____

_____

b. Extent of Channel/Business Partner use of Union Gas program & other needed information, Union Gas technical services or other support

_____

_____

c. Type of service & information support given customer generally and project specifically by Channel/Business Partner (engineering/financial analysis of alternatives, project engineering, project construction, ongoing Maintenance/Repair/Operations support, other/describe)

_____

d. Low/medium/high intensity of support by Channel/Business Partner to customer generally and project specifically

_____

e. Low/medium/high effect of on project's efficiency level

_____

2.4 PRELIMINARY CONCERNS

[If they express hesitation, use an appropriate combination of the following.]
Confidentiality. We are an independent research firm and will not report your individual responses in any way that would reveal your identity. Your response will only be presented in aggregate along with responses from other survey participants.
Security. Your responses will not affect your ability to participate in the program in the future. All responses are your opinion and there are no wrong answers.
Sales concern. I am not selling anything. I simply want to understand what factors were important to your company when deciding to install energy efficient equipment with assistance from this program.
Contact. For Union, the Channel Partners would have been notified by phone call or email from their Account Manager. If they have any questions, it is their Union Gas Account Manager they can call.
The Enbridge Industrial contact is Peter Goldman at 416-495-6348 or Stefan Surdu at 416-495-5917 or your Enbridge Energy Solutions Consultant/Union representative.

2.5 INTRODUCTION

A1. What is your primary line of business?
1. Consulting engineer
2. Manufacturer
3. Distributor or equipment sales
4. Installation contractor
5. Property manager
6. Other. A1b. Please specify. _____

2.6 CONFIRMATION OF EQUIPMENT INSTALLED

B1. Prior to the interview, review program records for the project or projects. In Table 1 below under "Program Records," check off each measure category for which energy efficient equipment was installed.

B2. Just to make sure that we're talking about the same project, I show that your company designed and specified/supplied/installed *[list major equipment or equipment categories]* at *[end use customer}***. To your recollection, was all this work completed?**
[Check off each category for which respondent recalls installing equipment. If information is not available from program records, ask the respondent to recall what measures were undertaken.]

B3. Do you recall if Union Gas/Enbridge provided financial assistance for installing this equipment?
1. Yes 2. No -8. Do not know -9. Refused

[Ask of only those checked in B2. Check off each category for which respondent recalls that Union Gas/Enbridge provided financial assistance.]

B3a. *[If yes, for Union Only]* **Who received the incentive, your company or the customer?**

1. Your Company
2. The Customer
-8. Do not know
-9. Refused

B3b. **Approximately how much was the incentive as a percent of the total project cost?**
*[Ask of only those checked in B3.]*_____*%*

-8. Do not know
-9. Refused

[Ask of only those checked in B2. Check off each category for which respondent recalls that Union Gas/Enbridge provided technical assistance for the measure.]

B4. **Did your company receive any technical or marketing assistance from Union Gas/Enbridge staff?**

1. Yes 2. No -8. Do not know -9. Refused

B4a. ***[If Yes]*** **Please describe.**

_____

_____

B5. **Was the customer aware that Union/Enbridge was involved with the project?**

1. Yes 2. No -8. Do not know -9. Refused

Table 1. Equipment in program records and recalled by respondent

[Check if Yes]

Measure Category	B1. Program Records	B2. Respondent Recollection	B3. Union /Enbridge Financial Assistance	B3a. Trade ally received incentive	B3b. Incentive as % of Project Cost	B4. Union /Enbridge Technical or Marketing Assistance	Notes/Caveats
a. Machine/Process	❒	❒	❒	❒	%	❒	
b. HVAC (incl. furnaces, all boilers, A/Cs, chillers, EMS, etc.)	❒	❒	❒	❒	%	❒	
c. Lighting	❒	❒	❒	❒	%	❒	
d Controls (boiler controls, variable frequency drive controls	❒	❒	❒	❒	%	❒	
e. Building envelope (incl. insulation, windows)	❒	❒	❒	❒	%	❒	
f. Domestic hot water	❒	❒	❒	❒	%	❒	
g. Refrigeration	❒	❒	❒	❒	%	❒	
h. Agriculture	❒	❒	❒	❒	%	❒	
i. Converted equipment from electricity to gas (fuel substitution)	❒	❒	❒	❒	%	❒	
j. Other: _____	❒	❒	❒	❒	%	❒	

2.7 SET THE CONTEXT

C1. Do you recall receiving energy efficiency information and/or training in any of the following areas that was sponsored or delivered by Union Gas/Enbridge?

1. Yes 2. No -8. Do not know -9. Refused

		Yes	No	Do not know	Refused
C1a.	**General energy efficiency information**	❒	❒	❒	❒
C1b.	**Energy audits**	❒	❒	❒	❒
C1c.	**Technology seminars**	❒	❒	❒	❒
C1d.	**Program information**	❒	❒	❒	❒
C1e.	**Specific project identification**	❒	❒	❒	❒
C1f.	**Training or workshops**	❒	❒	❒	❒
C1g.	**Software e.g., Cumulative Sum of Differences (CUSUM)**	❒	❒	❒	❒
C1h.	**Lunch & Learns**	❒	❒	❒	❒

2.8 FREE RIDERSHIP BATTERY

2.8.1 Program Influences

[Ask Questions in this section for all the equipment installed in aggregate.]

I'm going to ask a few more questions about the influence of Enbridge/Union Gas on your customer's decisions to install high efficiency equipment.

D1. On a scale of 1 to 5, where 1 = "not at all important" and 5 = "very important"… Please indicate how important each of the following aspects of your experience with [Enbridge/Union] were in the decision to install energy efficient equipment for your customer at this facility? *{VIP}*

D1a. Financial assistance **1 2 3 4 5** **-8 DK** **-9 Refused**

D1b. Project technical assistance **1 2 3 4 5** **-8 DK** **-9 Refused**

D1c. Your ongoing relationship with the utility **1 2 3 4 5** **-8 DK** **-9 Refused**

(Providing impartial advice and facilitating unbiased contacts, e.g., business partners)

D1d. Utility education activities **1 2 3 4 5** **-8 DK** **-9 Refused**

(e.g., case studies, best practice information, training, seminars, conferences, trade shows)

D1e. Marketing assistance **1 2 3 4 5** **-8 DK** **-9 Refused**

(e.g., lead generation, printed material)

D2. Did the assistance you received from [Enbridge/Union] in any way influence the <u>type</u> or <u>efficiency level</u> of the equipment, the <u>amount</u> of high efficiency equipment that was installed or efficient features that were added or process changes that were implemented?

1 Yes ➔ *Continue to Question D2a*
2 No (all the same equipment would have been installed at the same high efficiencies) ➔ *Skip to Question D3*
-8 Don't know ➔ *Skip to Question D3*
-9 Refused➔ *Skip to Question D3*

D2a. In what ways did the [Enbridge/Union] assistance change the plans or in any other way influence the decision to install energy efficient equipment? Be sure to identify specific equipment.
[Probe for whether the contractor added efficient features to make a more efficient system.]

_____

_____

_____

D2b. ***[Based on response to D2a, fill in a "1 to 5"score indicating the extent to which the program influenced the decision to install energy efficient equipment. DO NOT ASK RESPONDENT DIRECTLY. "1" indicates that the program had no influence; "5" indicates that the program was the primary reason that energy efficient equipment was installed.]***
{VIP}

(No program influence) 1 2 3 4 5 (Program was primary influence)
-8 Don't know -9 Refused

D3. Did this customer have specific plans in place to install <u>any</u> of the *[list <u>all</u> relevant measure categories]* **equipment prior to contacting your company regarding this project?**
1 Yes ➔ *Continue to Question D3a*
2 No ➔ *Skip to Next Section*
-8 Don't know ➔ *Skip to Next Section*
-9 Refused➔ *Skip to Next Section*

D3a. Please describe the plans to install the equipment prior to contacting you.
[Interviewer note: the goal here is to understand the plans that were in place before being influenced by the trade ally. Had they already planned to install all the measures and at the same level of efficiency and with all the energy saving features? Probe for equipment type, timing, quantity, and efficiency, as well as prior budgeting. Attempt to elicit responses that will provide answers for the "likelihood" or "share of savings" questions (E2a and E2b).]

_____

_____

_____

D3b. *[Based on responses to D3a, fill in a "1 to 5"score indicating the extent to which end user was already planning to install the energy efficient equipment prior to contact with the trade ally. DO NOT ASK RESPONDENT DIRECTLY. "1" indicates that respondent had no plans at all; "5" indicates that respondent had documented plans and had budgeted for all of the efficient equipment.]* ***{VIP}***

(No plans) 1 2 3 4 5 (Documented plans/budget)
-8 Don't know -9 Refused

D4. *[Enbridge only]* **Enbridge offers a higher incentive if three or more measures are implemented. Did this higher incentive figure in the decision process?**

1 Yes ➔ *Continue to Question D4a*
2 No ➔ *Skip to Next Section*
-8 Don't know ➔ *Skip to Next Section*
-9 Refused➔ *Skip to Next Section*

D4a. How?

_____

_____

_____

D4b. *[Based on responses to D4a, fill in a "1 to 5"score indicating how much influence the higher incentive had on the decision. DO NOT ASK RESPONDENT DIRECTLY.]* ***{VIP}***

(No influence) 1 2 3 4 5 (Critical Influence)
-8 Don't know -9 Refused

2.8.2 Direct Decision Making Questions

[Fill in Table 2 for most of these questions.]
[Ask the following questions for each measure category checked under Question B2 in Table 1 above. If previous open-ended questions have provided the necessary information, interviewer may skip the question/measure category. By the end of the interview, interviewer should be able to populate Table 2 below with EITHER a "likelihood" OR a "share of equipment" OR both, for each relevant measure category.]

Let me ask about the _____*[MEASURE CATEGORY]***.**

E1. **Did the *[Enbridge/Union]* assistance in any way change the timing of the installation?**
1. Yes 2. No -8. Do not know -9. Refused

E1a. *[If Yes]* **Was the equipment installed earlier or later than first planned?**
1. Earlier
2. Later

E1b. ***[If Yes to E1]* When would it have been installed without the program assistance?** ***{VIP}***
E1bM. ___ Month
E1bY. ___ Year
-7 Never -8. Do not know -9. Refused

Based on earlier responses, ask either the "likelihood" question below or the "share of equipment" question, whichever is more appropriate. For example, if respondent installed a single chiller, then the "likelihood" question may be most appropriate; if they installed multiple measures of various types/sizes, then the "share of equipment" may be more appropriate. Some respondents may be able to offer valid responses to both questions If you are uncertain, ask both questions. If respondent can provide a response to each, then record both responses.

E2a. ***[Likelihood]*** **What is the likelihood that you would have installed the same or similar _____ *[MEASURE CATEGORY]* of the same level of energy efficiency or with the same features that affect the overall system efficiency if it had not been for the assistance from [Enbridge/Union]?**
{VIP}

1 Definitely would NOT have installed equipment of the same level of energy efficiency
2 Definitely WOULD have installed equipment of the same level of energy efficiency anyway
3 MAY HAVE installed equipment of the same level of energy efficiency, even without the program
E2a2.About what percent likelihood? _____%
-8 Don't know
-9 Refused

E2b. ***[Share of equipment]*** **What share of the _____ *[MEASURE CATEGORY]* would you have installed anyway at the same level of energy efficiency if it had not been for the assistance from [Enbridge/Union]?** ***{VIP}***

[If necessary, or if the flow of the interview dictates, you may derive this value by asking 1) the share of equipment that would have been installed (at any efficiency) and 2) the share of installed equipment that would have been high efficiency. The value in the table below for Question E2b would be the product of these two values.]
-8 Don't know
-9 Refused

Table 2. Equipment

[Fill in EITHER the "likelihood" value OR the "share of equipment" value OR both values for each relevant measure category.

If respondents ask for the timeframe, use the timeframe specified above in Question E1a.

Then enter the appropriate free ridership value (E2c), which will be one of the following, depending on the nature of the project and the responses:

1) *The single value for "likelihood" or "share of equipment" if only one is entered;*
2) *If value provided for both, enter either Likelihood or Share value, whichever best represents the appropriate value*
3) *The product of the two, if appropriate (e.g., if there is a 50% likelihood that 75% of the equipment would have been installed, and respondent definitely wouldn't have done the final 25%)*

Measure Category	**E1. Change when the equipment was installed?**	**E1a. Forward or Slow**	**E1b. When would it have been installed?**	**E2a. Likelihood that energy efficient equipment…**		**E2b. Share of energy efficient equipment that…**	**E2c.** *[Entered by interviewer]*
				…would have been installed without the program			**Free Ridership Value**
a. Machine/Process	Y N DK R	F S	Months Yrs	%	and/or	%	%
b. HVAC (incl. furnaces, all boilers, A/Cs, chillers, EMS, etc.)	Y N DK R	F S	Months Yrs	%	and/or	%	%
c. Lighting	Y N DK R	F S					
d Controls (boiler controls, variable frequency drive controls	Y N DK R	F S	Months Yrs	%	and/or	%	%
e. Building envelope (incl. insulation, windows)	Y N DK R	F S	Months Yrs	%	and/or	%	%
f. Domestic hot water	Y N DK R	F S	Months Yrs	%	and/or	%	%
g. Refrigeration	Y N DK R	F S	Months Yrs	%	and/or	%	%
h. Agriculture	Y N DK R	F S	Months Yrs	%	and/or	%	%
i. Converted equipment from electricity to gas (fuel substitution)	Y N DK R	F S	Months Yrs	%	and/or	%	%
j. Other: _____	Y N DK R	F S	Months Yrs	%	and/or	%	%

E2d. *[Additional notes/caveats (e.g., explaining how/why free ridership value was chosen, if necessary)]*

E3. Overall, across all equipment, that is the entire project, how much of these extra energy savings would have been achieved anyway, even without the assistance from [Enbridge/Union]. Please provide a lower and upper bound, and then your best estimate. {VIP}

***[If needed for clarification:]* For example, 50% means that half of the extra savings from the energy efficient equipment would have been achieved anyway. Remember, I'm asking only about the extra savings from installing energy efficient equipment instead of standard equipment.**

E3A. Lower bound ➔ _____ % E3B. Upper bound ➔ _____ % E3C. Best estimate ➔ _____ %

2.9 PARTICIPANT INSIDE SPILLOVER

G1. Did the assistance from [Enbridge/Union] in any way influence you to help the customer install additional energy efficient equipment *at the same site* that did not get reported to the program (i.e., *equipment that would not have been installed without the influence of the program)***?**

1 Yes➔ Continue to Question G2
2 No ➔ Skip to next section
-8 Don't know ➔ Skip to next section
-9 Refused➔ Skip to next section

G2. [*If G1 = "yes"]* **What year did this equipment get installed?**

-8 Don't know
-9 Refused

G3. *[If G1 = "yes"]* **Please briefly describe how the program assistance from [Enbridge/Union] influenced the decisions to install additional energy efficient equipment at the same site.**
[Identify the types of equipment affected.]

G4. Would you estimate the energy savings from this additional equipment to be less than, similar to, or more than the savings from the energy efficient equipment from the original project?

1 Less than the original project ➔
G4a. About what percentage of the savings from the original project?
____% *[Enter a number less than 100%]*
2 About the same savings
3 More than the original project ➔
G4b. About what percentage of the savings from the original project?
____% *[Enter a number greater than 100%]*
-8 Don't know
-9 Refused

G5. What share of the savings from this additional equipment can reasonably be attributed to the influence of the assistance from [Enbridge/Union]?

_____% *[100% or less]*
-8 Don't know
-9 Refused

[Interviewer may be able to complete this based on response to G3, or at least use G3 to check for consistency. Probe if inconsistent to ensure that respondent is correctly interpreting the question.]

2.10 PARTICIPANT OUTSIDE SPILLOVER

H1. Did the assistance from [Enbridge/Union] in any way influence you to help the company to install any additional energy efficient equipment *at other jobs or facilities in Union Gas/Enbridge's Service Territory* beyond what they would have done otherwise?
[Don't include projects that participated in another Union/Enbridge program.]

1 Yes ➔
H1a. How many other facilities were influenced (that did not participate in Union Gas/Enbridge programs)? _____ (-8 Don't know, -9 Refused)
2 No ➔ Skip to next section
-8 Don't know ➔ Skip to next section
-9 Refused ➔ Skip to next section

H2. *[If H1 = "yes"]* **Please briefly describe how the assistance has influenced the decisions to install this equipment. (Probe to identify the types of equipment affected.)**

_____

_____

H3. On average, would you estimate the energy savings from these other non-program projects to be less than, similar to, or more than the savings from the energy efficient equipment from the program-supported project that we've been discussing?
[E.g., if the same equipment was implemented in a facility twice as big, then savings would be 200%. Be sure to emphasize that this is savings "on average" not in aggregate across the many buildings that might be affected.]

1. Less than the Custom Projects project
   H3A. About what percentage of the savings from the Custom Projects project? ____% *[Enter a number less than 100%]*
2. About the same savings
3. More than the Custom Projects project
   H3B. About what percentage of the savings from the Custom Projects project? ____% *[Enter a number greater than 100%]*

-8 Don't know
-9 Refused

H4. What share of the savings from energy efficient equipment at these facilities can reasonably be attributed to the influence of the assistance from [Enbridge/Union]?
[Interviewer may be able to complete this based on response to H2, or at least use H2 to check for consistency. Probe if inconsistent to ensure that respondent is correctly interpreting the question.]

_____% [100% or less]
-8 Don't know
-9 Refused

2.11 CLOSING

Those are all the questions I had.

Z9. Do you have any final comments you would like to make?

_____

_____

_____

Thank you very much for your time!

Z10. Record all additional or supporting comments here.

_____

_____

_____

2. CUSTOM PROJECTS AUDIT-ONLY SURVEY

2.1 CONVENTIONS

- Blue text is spoken.
- Italics text is instructions for the interviewer.
- Arial, bold font in brackets is skip instructions **[skip instructions]**
- Underlined in brackets are data from the sample: [sample data]

2.2 INTERVIEWER DATA

Interviewer ID
Survey Date
Survey Duration

2.3 SAMPLE DATA

Sample ID #
Contact Name
Contact Title
Contact Phone Number
Firm Name
Address
Company Phone Number
Audit Date
Recommended measure description (up to 5 per customer)
Recommended measure estimated gas savings (up to 5 per customer)

2.4 RECALL AUDIT, IDENTIFY RESPONDENT

[Enbridge] **According to our records, you had an energy or HVAC audit conducted by a third party professional that was co-funded by Enbridge Gas Distribution on [date].**

[Union] **According to our records, you had a boiler audit or feasibility study conducted with financial assistance provided by Union Gas on [date].**

1. Do you recall receiving that audit?

1. Yes ..... 2. No ..... -8. Do not know
..... -9. Refused

2. [If not Yes] **Can you suggest someone else at your company who might be familiar with the audit?**

1. Yes ..... 2. No ..... -8. Do not know
..... -9. Refused

If yes, get name and phone. Ask to speak with this person. Start again at the beginning.

2.5 MEASURE-SPECIFIC QUESTIONS

[The interviewer will repeat these questions for each audit recommendations (limit of 5 recommendations).]

3. The audit recommended that you implement [recommendation]. Do you recall that recommendation?

1. Yes ..... 2. No ..... -8. Do not know
..... -9. Refused

4. Has it been installed or implemented?

1. Yes ..... 2. No ..... 3. Partial
..... 4. Caveat
-8. Do not know ..... -9. Refused

Partial = Some of the recommended equipment was installed but not all.
Caveat = Installed something related to the recommendation but not the exact thing recommended

[If Q4=3]

5. What percent of the items recommended or equipment did you install?

Enter percents as whole numbers, thus 90% would be entered as "90" NOT "0.9".

-8 Don't know ..... -9 Refused

[If Q4=4]

6. The audit estimated that this item [or the actual equipment] would save [savings] cubic meters of gas. What percent of that estimated savings do you think you achieved?

Enter percents as whole numbers, thus 90% would be entered as "90" NOT "0.9".

-8 Don't know ..... -9 Refused

[If not installed (Q4=2, -8, -9)]

6A. Why have you not implemented this recommendation yet?

1. We plan to but have not yet
2. Do not have the money
3. We do not have that equipment any more
4. Other

6AOther. **[Capture verbatim]**

-8 Don't know
-9 Refused

[If not installed (Q4=2, -8, -9), skip to the next recommendation. If last recommendation, skip to the next section.]

7. When was it installed?

Record month and year installed

-8 Don't know..... -9 Refused

8. On a scale of 1 to 5 where 1 is "no influence" and 5 is "a great deal of influence", how much influence did the audit have in your decision to implement this item?

1 2 3 4 5..... -8 Don't know -9 Refused

9. What share of the savings from this item can reasonably be attributed to the influence of the audit?

Enter percents as whole numbers, thus 90% would be entered as "90" NOT "0.9".

-8 Don't know..... -9 Refused

2.6 FIRMOGRAPHICS

Now I have just a few questions about your company.

Z1. Approximately how large is the facility that received the audit? (square feet)?

1. Up to 5,000
2. 5,001 to 10,000
3. 10,001 to 15,000
4. 15,001 to 25,000
5. 25,001 to 50,000
6. 50,001 to 100,000
7. 100,001 to 200,000
8. 200,001 to 500,000
9. Over 500,000
-8 Do not know
-9 Refused

Z2. Is the facility you work in independent, or part of a larger organization?

1. Independent
2. Part of a larger company
3. Other

Z3Other. [Capture verbatim]

-8. Don't know
-9. Refused

Z3. Approximately how many full time employees or full time equivalents does your organization have at your locations in Ontario?

1. Fewer than 5
2. 5 to 9
3. 10 to 19
4. 20 to 49
5. 50 to 99
6. 100 to 249
7. 250 or More
-8 Do not know
-9 Refused

Those are all the questions I had. Thank you very much for your time!

3. CUSTOM PROJECTS NONPARTICIPANT SPILLOVER SURVEY

3.1 CONVENTIONS

- Blue text is spoken.
- Italics text is instructions for the interviewer.
- Arial, bold font in brackets is skip instructions: **[skip instructions]**
- Underlined in brackets are data from the sample: [sample data]

3.2 INTERVIEWER DATA

Interviewer ID
Survey Date
Survey Duration

3.3 SAMPLE DATA

Sample ID # (Per Sample File)
Contact Name
Contact Title
Contact Phone Number
Firm Name
Address
Company Phone Number
Dwtp Code Desc (Per Sample File)
Utility (Enbridge / Union Gas – Per Sample File)

3.4 QUALIFY RESPONDENT, EXPLAIN PURPOSE

Find someone knowledgeable about the company's buildings and equipment.

Q1. May I speak with the plant engineer or facilities manager?

1 Yes **[CONTINUE WITH INTRODUCTION]**
-8 Do Not Know **[PROMPT WITH DESCRIPTION OF APPROPRIATE CONTACT]**
-9 Refused **[THANK AND TERMINATE]**

DESCRIPTION OF APPROPRIATE CONTACT (If necessary):

I would like to speak with someone who is accountable for energy efficiency or who is responsible for your building's operation and is knowledgeable about your company's energy-using equipment, like space and water heating, ventilation, and industrial processes.

INTRODUCTION - Once you have the person on the phone (or if needed to find the person) say:

I am calling on behalf of [Enbridge/Union Gas] to ask some questions about your plant or building operation and equipment to help [Enbridge/Union Gas] improve their energy efficiency programs.

If necessary:

Confidentiality: **We will not report your individual answers to [Enbridge/Union Gas]. We only report results aggregated across all the respondents.**

Record

Q2. Name
Q3. Phone number

3.5 PARTICIPATION SCREENING

P1. Have you heard of [Enbridge/Union Gas'] energy efficiency program?

1 Yes **[SKIP TO P3]**
2 No
-8 Don't Know
-9 Refused

P2. The energy efficiency program is designed to provide incentives and technical assistance for implementing projects that save energy. Does that sound familiar?

1 Yes
2 No **[THANK AND TERMINATE]**
-8 Don't Know **[THANK AND TERMINATE]**
-9 Refused **[THANK AND TERMINATE]**

P3. Have you received financial incentives through the program to make energy efficiency improvements or conduct an energy audit?

1 Yes **[THANK AND TERMINATE]**
2 No
-8 Don't Know
-9 Refused

P4. Have you had contact with [Enbridge/Union Gas'] energy efficiency program through a trade show, attending a workshop or receiving a publication?

1 Yes
2 No
-8 Don't Know
-9 Refused

3.6 EQUIPMENT SCREENING

S1. Have you modified or installed any of the following types of equipment since the beginning of 2005?

Read each option.

Equipment	Yes	No	Don't Know	Refused
a. Space Heating	1	2	-8	-9
b. Water Heating	1	2	-8	-9
c. Steam generation	1	2	-8	-9
d. Other kind of heating	1	2	-8	-9
e. Ventilation	1	2	-8	-9
f. Industrial process improvements	1	2	-8	-9
g. Building controls	1	2	-8	-9

[IF 'NO, DK or RF' TO ALL IN S1, THANK AND TERMINATE]

[FOR EACH 'YES' IN S1 ASK]

S2. When did you make that change?

Record month and year.

Equipment	Month	Year	Don't Know	Refused
a. Space Heating	-- --	-- -- -- --	-8	-9
b. Water Heating	-- --	-- -- -- --	-8	-9
c. Steam generation	-- --	-- -- -- --	-8	-9
d. Other kind of heating	-- --	-- -- -- --	-8	-9
e. Ventilation	-- --	-- -- -- --	-8	-9
f. Industrial process improvements	-- --	-- -- -- --	-8	-9
g. Building controls	-- --	-- -- -- --	-8	-9

3.7 PROGRAM INFLUENCE

[FOR EACH 'YES' IN S1 ASK]

G1. On a scale of 1 to 5 where 1 is "no influence" and 5 is "a great deal of influence", how much influence did the [Enbridge/Union Gas] energy efficiency program have in your decision to install or modify your [Equipment]?

Equipment	No Influence				Great Deal of Influence	Don't Know	Refused
a. Space Heating	1	2	3	4	5	-8	-9
b. Water Heating	1	2	3	4	5	-8	-9
c. Steam generation	1	2	3	4	5	-8	-9
d. Other kind of heating	1	2	3	4	5	-8	-9
e. Ventilation	1	2	3	4	5	-8	-9
f. Industrial process improvements	1	2	3	4	5	-8	-9
g. Building controls	1	2	3	4	5	-8	-9

[FOR EACH 'YES' IN S1 ASK]

G2. What share of the savings from this change can reasonably be attributed to the influence of the [Enbridge/Union Gas] energy efficiency program?

Enter percents as whole numbers, thus 90% would be entered as "90" NOT "0.9".

Equipment	%	Don't Know	Refused
a. Space Heating	-- -- --	-8	-9
b. Water Heating	-- -- --	-8	-9
c. Steam generation	-- -- --	-8	-9
d. Other kind of heating	-- -- --	-8	-9
e. Ventilation	-- -- --	-8	-9
f. Industrial process improvements	-- -- --	-8	-9
g. Building controls	-- -- --	-8	-9

[FOR EACH 'YES' IN S1 ASK]

G3. On a scale of 1 to 5 where 1 is "no influence" and 5 is "a great deal of influence", how much influence did your suppliers or contractors have in your decision to install or modify your [Equipment]?

Equipment	No Influence				Great Deal of Influence	Don't Know	Refused
a. Space Heating	1	2	3	4	5	-8	-9
b. Water Heating	1	2	3	4	5	-8	-9
c. Steam generation	1	2	3	4	5	-8	-9
d. Other kind of heating	1	2	3	4	5	-8	-9
e. Ventilation	1	2	3	4	5	-8	-9
f. Industrial process improvements	1	2	3	4	5	-8	-9
g. Building controls	1	2	3	4	5	-8	-9

3.8 FOLLOW-UP CALL OK?

[IF P4 > 2 OR P5 > 30% FOR ANY MEASURE FROM S1 THEN CONTINUE. ELSE, TERMINATE]

F1. We want to have one of our engineers ask you some technical questions about the equipment changes you made. Will that be OK?

1 Yes **[VERIFY/COLLECT CONTACT INFORMATION]**
2 No **[THANK AND TERMINATE]**
-8 Don't Know **[THANK AND TERMINATE]**
-9 Refused **[THANK AND TERMINATE]**

May I verify your:

F2. Name _____ [PRE-FILL WITH INFO FROM Q2]
F3. Phone number _____ [PRE-FILL WITH INFO FROM Q3]
F4. Email Address _____

Those are all the questions I had. Thank you very much for your time!

Appendix C – Custom Free Ridership and Participant Spillover Jurisdictional Review prepared by Navigant Consulting Inc.

NAVIGANT

Custom Free Ridership and Participant Spillover Jurisdictional Review

Prepared for:
Sub-Committee of the Ontario
Technical Evaluation Committee

May 29, 2013

Prepared by:
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NAVIGANT

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NAVIGANT

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Executive Summary

Union Gas Limited (Union) and Enbridge Gas Distribution (Enbridge) have delivered Demand Side Management (DSM) initiatives since 1997 and 1995, respectively, including programs that involve custom projects in the commercial and industrial (C&I) sectors. In 2007-2008, Summit Blue Consulting (now part of Navigant's Energy Practice) conducted the first attribution study of Union and Enbridge's custom C&I programs to evaluate free ridership (FR) and spillover effects. After the study, the Ontario Energy Board (OEB) approved the FR adjustment, but did not approve the spillover factor. Since that time, there have been a host of program environment changes, including economic conditions, energy prices, advances in technology, as well as changes in the design and delivery of the custom programs. As a result, Ontario's Technical Evaluation Committee (TEC) is prioritizing updates to FR and spillover adjustment factors as part of its mandate.

This report provides information to support a sub-committee of Ontario's TEC in its deliberations on the appropriate approach to Net-to-Gross (NTG) values in Ontario. Through a jurisdictional review of the approach to net savings, and a review of researched NTG values for programs comparable to Union and Enbridge's custom C&I gas programs, Navigant provides an assessment of the various approaches to NTG.

ES 1. Report Objectives

There are a range of options for NTG that could be adopted for natural gas DSM programs in Ontario, from transferring NTG values from similar jurisdictions and programs to conducting research to estimate a NTG value.

The objective of this report is to provide information to assist the TEC sub-committee in their determination on the appropriate approach to NTG for DSM programs in Ontario, and not to provide a specific recommendation. While this report is not comprehensive in addressing all potential considerations, such as other benefits of accurate (costs of inaccurate) NTG values, it provides important information relevant to the discussion. In addition to summarizing the regulatory and methodological approach taken by other jurisdictions, and summarizing NTG values for programs with characteristics similar to Union and Enbridge's custom C&I programs, Navigant provides insight into the risks associated with inaccurate NTG values and the approximate cost of mitigating those risks.

ES 2. Key Findings

To achieve the objective of this report, Navigant (1) reviewed the approach to net savings across a wide array of jurisdictions in the United States and Canada to identify trends in the regulatory and methodological approach to net savings, (2) conducted a review of researched NTG values of non-residential gas programs in selected jurisdictions, and (3) conducted a decision analysis to assess the options for NTG. Key findings are presented for each of these.

Approach to Net Savings

Navigant conducted research to provide a summary of the regulatory and methodological approach to net savings adopted by jurisdictions across North America. In total, Navigant reviewed the approach to net savings taken by 42 jurisdictions across North America, representing the vast majority of jurisdictions with ratepayer-funded energy efficiency programs.

The majority of jurisdictions with ratepayer funded energy efficiency programs conduct NTG research, though only half adjust gross savings based on research. While there appears to be a trend towards considering participant and non-participant spillover in NTG research in recent years, the majority of research only includes FR adjustments. Both FR and spillover are most commonly estimated through a self-report (participant survey) approach, though econometric methods (e.g., billing analysis) and market share modeling approaches are occasionally used.

Navigant also researched whether jurisdictions offer utility performance incentives for meeting their savings goals. U.S. states that provide a performance incentive mechanism for utilities or program administrators are more likely to make deemed or researched NTG adjustments.

Researched NTG Values in Selected Jurisdictions

Navigant reviewed a total of 19 documents that conducted NTG research of non-residential gas programs covering nine jurisdictions in North America, including: California, Colorado, Massachusetts, Minnesota, New Jersey, New Mexico, Oregon, Washington, and Wisconsin. Within these 19 documents, 38 distinct NTG values were reported.

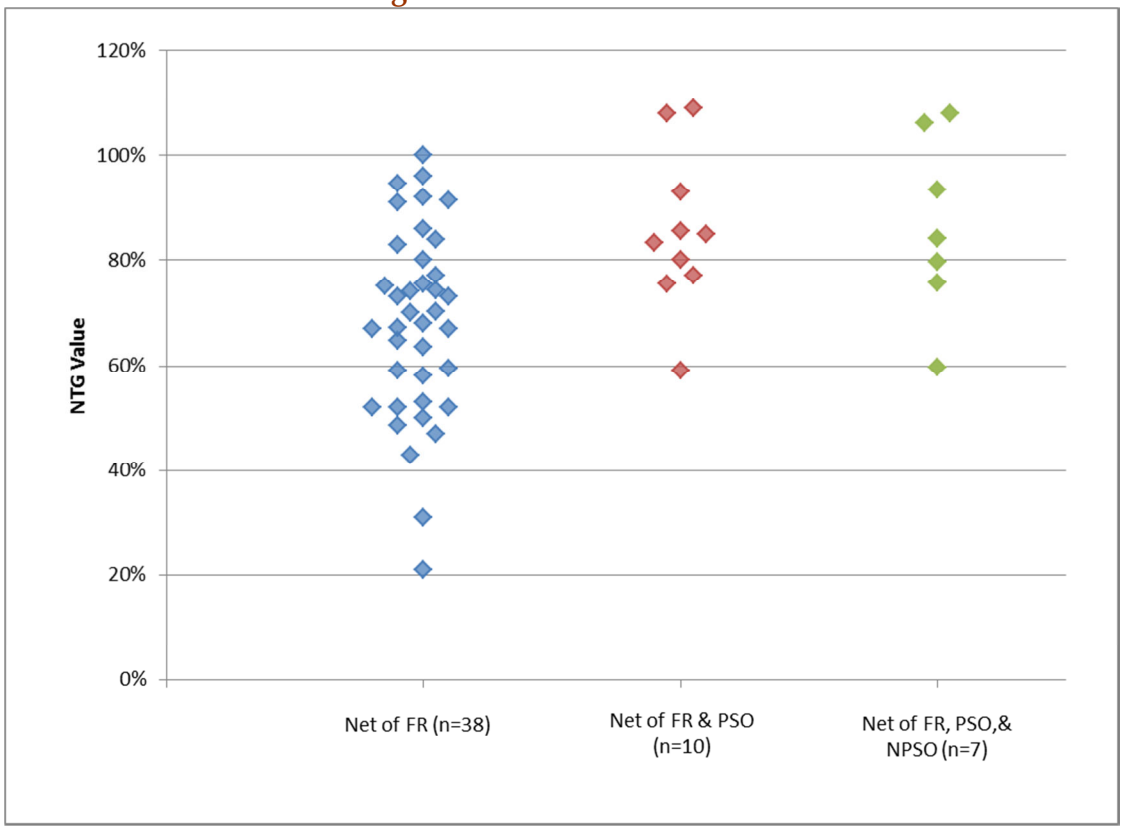
Different formulations of NTG values are presented, with each including or excluding different NTG factors. In particular, the following NTG values are presented:

- Net-of-free ridership = 1- FR,
- Net-of-free ridership and participant spillover = 1 – FR + PSO, and
- Net-of-free ridership and all spillover = 1- FR + PSO + NPSO
  (Note: NPSO is non-participant spillover)

This approach conveys information on NTG values based on the common definitions across the studies, and avoids inappropriate comparisons that could result from comparing the studies' reported NTG values when they include different components.

A review of researched net-of-free ridership values for non-residential gas programs exhibits a wide dispersion (21% to 100%) with a slight "clustering" of values between 40% and 90%, as shown in Figure ES-1. The average net-of-free ridership value is 68%. As expected, NTG values are larger when considering spillover. Average net-of-free ridership & PSO value is 86% and average net-of-free ridership & spillover value is 87%, suggesting that NPSO is small for non-residential gas programs.

Figure ES-1. NTG Values



Source: Navigant analysis. Note that the sample size (n) represents the number of unique NTG values (program-utility-year combinations) reported in the 19 studies.

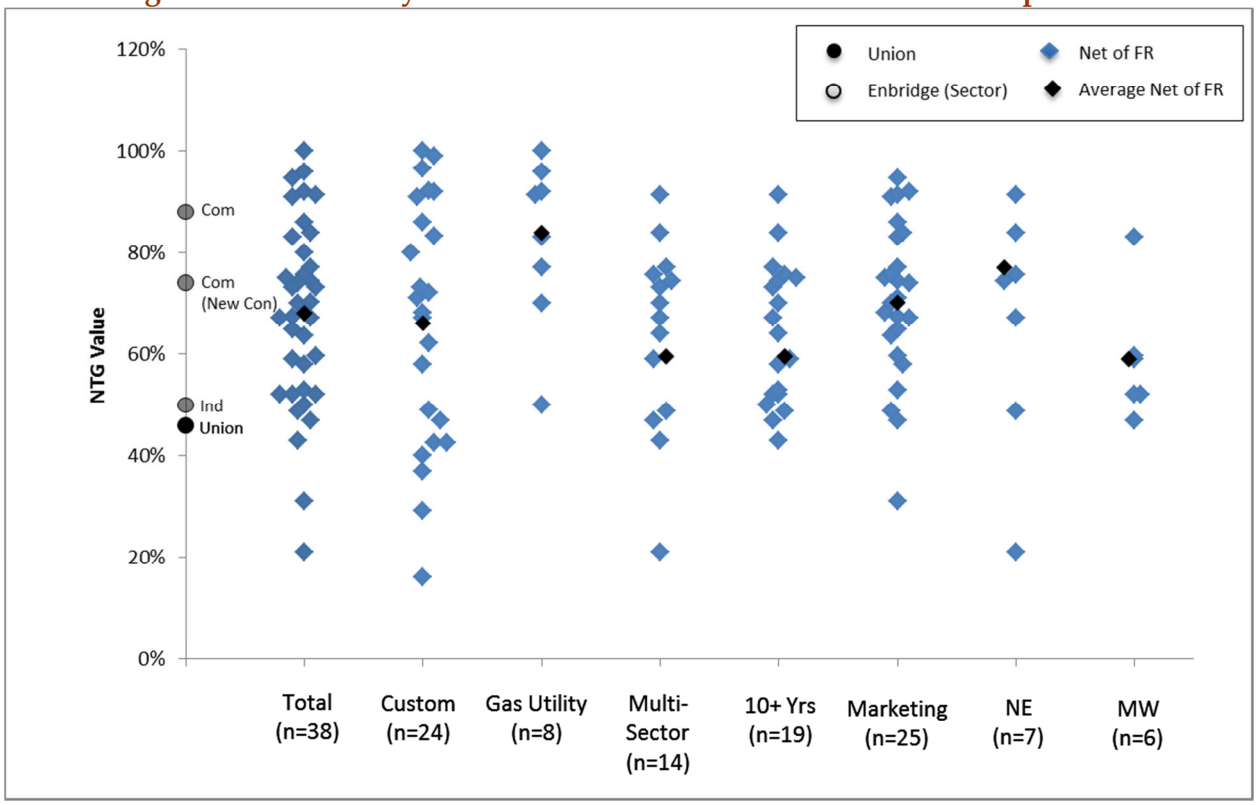
To provide additional context Navigant reviewed NTG values by study, program year and region and found that the variation in NTG values did not appear to be driven by the program evaluator, program year, or region. Navigant also examined whether variation in NTG values resulted from differences in the analytic rigor of the methodology (all used self-reports), using enhanced self-report methods in the form of trade ally feedback as a proxy. Free ridership values appeared lower with the inclusion of trade ally feedback. Finally, Navigant compared electric NTG values to gas NTG values for studies that reported both values and found that gas NTG values exhibited a wider dispersion.

Navigant also reviewed researched NTG values based on specific program characteristics: program type, customer segment, utility-type, program maturity, and program marketing strategy. Trends in NTG values are less defined and should be interpreted with caution due to the small sample sizes. Nevertheless, some trends emerged: NTG values for custom programs exhibited a wider dispersion than programs offer prescriptive incentives or both, programs offered by gas-only utilities appear to have lower FR than programs offered by combination utilities, and FR appears to be greater with program maturity.

Figure ES-2 presents the net-of-free ridership values for program characteristics that are most similar to Union and Enbridge's custom C&I programs. In addition, Union and Enbridge's

current NTG values, based on the 2007-2008 research conducted by Navigant (formerly Summit Blue Consulting) are presented. Note that Union currently uses one NTG value for C&I custom programs while Enbridge uses sector-specific NTG values.

Figure ES-2. Summary of Relevant Researched Net-of-Free Ridership Values



Source: Navigant analysis. Note that the sample size (n) represents the number of unique NTG values (program-utility-year combinations).

Both Union and Enbridge's current NTG values are within the range of researched values. Union's NTG value is below the average value. Enbridge's NTG value for the commercial sector is above the average value while the NTG value for the industrial sector is below the average value.

Assessing Options for NTG

Gross savings can usually be estimated quite accurately, however, estimating net savings poses greater challenges. Given the uncertainty around any NTG value, Navigant applied a Decision Analysis approach for organizing information around alternative approaches to setting NTG values.

There are a number of benefits resulting from more precise NTG values, including the ability to improve program design and implementation, more accurate utility incentive payments, and the ability to consider energy savings as a resource. Navigant conducted a value of information

(VIF) analysis on the second benefit, incentive payments, as the benefit/cost of improved information can be easily quantified.

To support the VIF analysis, Union and Enbridge conducted a sensitivity analysis of utility incentive payments resulting from their custom programs, using a +/- 10 percentage point margin of error on the custom programs NTG values. This analysis revealed that improving the precision of custom NTG values has a sizable impact on incentive payments. Table ES-1 and Table ES-2 present a value of information analysis for Union and Enbridge respectively at targeted net savings.

Table ES-1. Value of Information Assessment for Union

	NTG Value for Custom Programs		Incentives	Change in Incentives
Base Case:	**Current NTG** NTG = 0.46	→	Incentives = $2.73 M	
Scenario 1:	**Higher True NTG** NTG = 0.56	→	Incentives = $5.63 M	**(+$2.90 M)**
Scenario 2:	**Lower True NTG** NTG = 0.36	→	Incentives = $0.8 M	**(-$1.93 M)**

Source: Sensitivity analysis provided by Union.

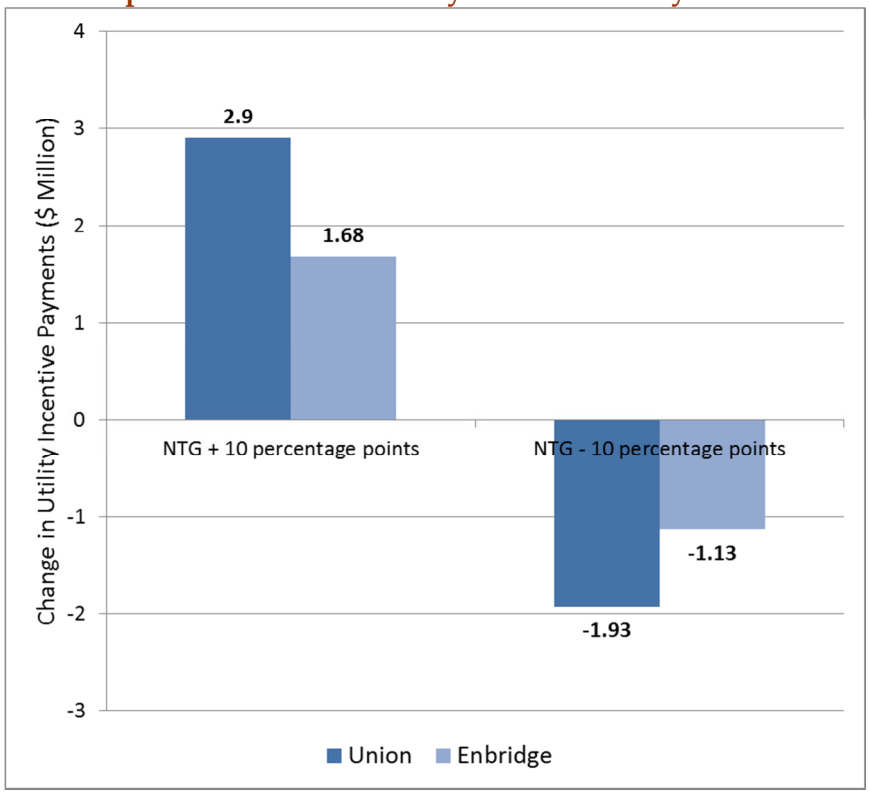
Table ES-2. Value of Information Assessment for Enbridge

	NTG Value for Custom Programs		Incentives	Change in Incentives
Base Case:	**Current NTG by Program** Commercial = 0.80 Commercial New Construction = 0.74 Industrial = 0.50	→	Incentives = $2.58 M	
Scenario 1:	**Higher True NTG** Commercial = 0.90 Commercial New Construction = 0.84 Industrial = 0.60	→	Incentives = $4.26 M	**(+$1.68 M)**
Scenario 2:	**Lower True NTG** Commercial = 0.70 Commercial New Construction = 0.64 Industrial = 0.40	→	Incentives = $1.45 M	**(-$1.13 M)**

Source: Sensitivity analysis provided by Enbridge.

The penalty for assuming a NTG value that is +/- 10 percentage points different from the actual NTG value is roughly $1 to $3 million in utility incentive payments, as shown in Figure ES-3. If the cost of revising the NTG values is less than $0.5 million then revising the values *could be judged to be warranted* assuming NTG research could reduce the margin of error by one-half (i.e., the range of the likely true NTG values).

Figure ES-3. Comparison of the Sensitivity of Incentive Payments to NTG Values



Source: Sensitivity analyses provided by Union and Enbridge.

Navigant provides a brief review of five general approaches to NTG, providing an estimate of the improved precision of the NTG value and the approximate cost per utility (Table ES-3). Alternate NTG approaches could improve the precision of NTG values by approximately 50% at an approximate cost of $0.25 - $0.50 million per utility.

Table ES-3. Ability of NTG Approaches to Produce More Precise NTG Values

General NTG Approach	Estimated Improved Precision (or Reduced Range) of NTG Value	Cost of NTG Approach per Utility (approximate)
Transfer NTG Values from Other Research	Little change	$3 – 5k
Adjust NTG Values based on Program Factors	Little change	$5 – 10k
Align NTG Values using Limited Primary Data	3 percentage points	$100 – 200k
Full NTG Research Study – After Program Year	5 percentage points	$250 – 500k
Integrated/Fast Feedback NTG Estimation	5 percentage points	$250 – 500k

Source: Navigant analysis.

1. Introduction

This report provides information to support the sub-committee of Ontario's TEC in its deliberations on the appropriate approach to NTG values in Ontario. Through a jurisdictional review of the approach to net savings, and a review of researched NTG values for programs comparable to Union and Enbridge custom C&I gas programs, Navigant provides an assessment of the various approaches to NTG.

1.1 Background

Union and Enbridge have delivered Demand Side Management (DSM) initiatives since 1997 and 1995, respectively, including programs that involve custom projects in the C&I sectors. Custom projects cover opportunities where savings are linked to unique end uses and technologies. The DSM portfolio for both utilities includes several hundred custom projects annually. Union and Enbridge DSM activities are regulated by the OEB.

In June, 2011, Union and Enbridge entered into a new DSM regulatory framework. In addition to filing comprehensive, multiyear program plans, Union and Enbridge established Terms of Reference (ToR) for engaging stakeholders. The ToR established engagement processes, and included the creation of a common TEC for both gas utilities. The goal of the TEC is to "establish DSM technical and evaluation standards for measuring the impact of natural gas DSM programs in Ontario."[1]

In 2007-2008, Navigant (formerly Summit Blue Consulting) conducted the first attribution study of Union and Enbridge's custom C&I programs to evaluate FR and spillover effects.[2] The OEB approved the FR adjustment, but did not approve the spillover factor. Since that time, there have been a host of program environment changes, including economic conditions, energy prices, advances in technology, as well as changes in the design and delivery of the custom programs. As a result, the TEC is prioritizing updates to FR and spillover adjustment factors as part of its mandate.

1.2 Report Objective

There are a range of options for addressing net savings that could be adopted for natural gas DSM programs in Ontario, from deeming a NTG value to conducting research to estimate a NTG value. The objective of this report is to provide information to assist the TEC sub-committee in their deliberations on appropriate approaches for developing an NTG value for these programs. This report is not meant to provide a specific recommendation, but rather to

[1] *2012 Custom Free Ridership and Participant Spillover Jurisdictional Review Request for Proposal,* Ontario Natural Gas Technical Evaluation Committee, October 29, 2012.

[2] *Source:* Summit Blue Consulting. 2008. *Custom Projects Attribution Study.* Union Gas Limited and Enbridge Gas Distribution, October 27, 2008.

provide information on the range of approaches to assist the TEC sub-committee in making their determination.

The steps taken to achieve this objective include the following:

- Understand the portfolio of Union and Enbridge's custom C&I gas programs (Section 3)
- Review the approach to net savings across a wide array of jurisdictions in the United States and Canada to identify trends in the regulatory and methodological approach to net savings (Section 4)
- Conduct a review of researched NTG values of non-residential gas programs in selected jurisdictions (Section 5)
- Conduct a decision analysis to assess the options for NTG (Section 0)

2. Methodology

This section describes the methodology Navigant employed to provide information to assist the TEC sub-committee in their deliberations on the appropriate approach to NTG for custom natural gas DSM programs in Ontario. The sub-sections that follow discuss the four distinct tasks conducted by Navigant:

- Reviews of the custom C&I natural gas programs,
- Summary of research methods and regulatory approaches to net savings,
- Review of researched NTG values in selected jurisdictions, and
- Assessing options for updating NTG values for these programs.

2.1 *Union and Enbridge Programs*

To develop an understanding of the portfolio of Union and Enbridge's custom C&I gas programs, Navigant conducted a review of the following:

- Description of programs included in the *2012 Custom Free Ridership and Participant Spillover Jurisdictional Review* request for proposal, and
- Union and Enbridge program websites.

Union and Enbridge also provided additional information on features of program design and implementation as requested by Navigant.

2.2 *Approach to Net Savings*

Navigant conducted research to provide a summary of the regulatory and methodological approach to net savings adopted by jurisdictions across North America, as well as whether jurisdictions offer utility performance incentives for meeting their savings goals. The research methodology included a review of:

- Utility websites,
- Regulatory agency websites,
- Websites of research/advocacy groups such as the Regulatory Assistance Project (RAP), American Council for an Energy-Efficiency Economy (ACEEE), Consortium for Energy Efficiency (CEE), and the Edison Foundation, and
- Studies that previously surveyed the approach to net savings.[3]

In total, Navigant reviewed the approach to net savings taken by 42 jurisdictions across North America, representing the vast majority of jurisdictions with ratepayer-funded energy efficiency programs. In addition, a review of the approach to net savings in nine selected jurisdictions is discussed in the following section.

[3] Refer to 7.Appendix A for a list of references for methodological resources.

2.3 *Researched NTG Values in Selected Jurisdictions*

To provide the TEC sub-committee with a comprehensive review of researched NTG values Navigant worked with the TEC sub-committee in an iterative process to identify relevant jurisdictions/ programs and accompanying evaluation studies. The research methodology included:

- Review of program evaluations conducted by Navigant and Summit Blue Consulting (acquired by Navigant in 2010),
- Review of program evaluations identified by Navigant staff,
- Review of the Northeast Energy Efficiency Partnerships' Repository of State and Topical EM&V Studies,
- Search of the California Measurement Advisory Council searchable database,
- Search of the Consortium for Energy Efficiency searchable database,
- Review of State and Utility websites for program evaluations and filings,
- General internet searches for program evaluations, and
- Outreach to industry professionals.

This list was revised to develop a shortlist of programs comparable to Union and Enbridge's programs, accounting for factors such as customer segment and program design. Additional studies were excluded due to the methodology employed and/or the applicability of the reported NTG values.[4]

NTG values for programs targeting natural gas savings is the focus of this report due to the greater than expected availability of gas utility studies, as well as combination utility studies where natural gas NTG values were reported separately.

A total of 19 documents[5] were selected covering nine jurisdictions in North America, including: California, Colorado, Massachusetts, Minnesota, New Jersey, New Mexico, Oregon, Washington, and Wisconsin. In some cases, one document reported NTG values for multiple programs, multiple utilities, or multiple program years. In total, 38 distinct NTG values were reported. Table 1 presents the number of distinct values reported across the 19 documents.

[4] Refer to Appendix B for an example of two notable studies/jurisdictions excluded from the analysis.
[5] Refer to Appendix C for an annotated bibliography of these documents.

Table 1. Documents Reviewed and Distinct NTG Values Reported

Document Number and Title	Number of Distinct Values Reported	Reason for Including Multiple Values
1. 2004/2005 Statewide Express Efficiency and Upstream HVAC Program Impact Evaluation	4	NTG values reported for 4 utilities: PG&E, SDG&E, SCE, and SCG.
2. 2004-2005 Statewide Nonresidential Standard Performance Contract Program Measurement and Evaluation Study	2	NTG values reported for 2 investor-owned utilities: PG&E and SDG&E.
3. 2006-2008 Retro-Commissioning Impact Evaluation	4	NTG values reported for 4 utilities: PG&E, SDG&E, SCE, and SCG.
4. 2011 Commercial and Industrial Natural Gas Programs Free-Ridership and Spillover Study	6	NTG values reported for 6 utilities: NSTAR, Unitil, New England Gas, National Grid, Columbia Gas, and Berkshire Gas.
5. Evaluation of 2011 DSM Portfolio	2	NTG values reported for 2 programs: Commercial Solutions and SCORE pilot.
6. Fast Feedback Results	3	NTG values reported for 3 programs: Existing Multifamily, Existing Buildings, and Industrial Production Efficiency.
7. Impact and Process Evaluation of the 2006-2007 Building Efficiency Program	2	NTG values reported for 2 program-years: 2006 and 2007.
8. Evaluation of Building Efficiency Program 2004 & 2005	2	NTG values reported for 2 program-years: 2004 and 2005.
9. Impact and Process Evaluation of the 2006-2007 New Building Efficiency Program	2	NTG values reported for 2 program-years: 2006 and 2007.
10. Focus on Energy Evaluation: Business Programs Impact Evaluation Report – Last Quarter of Calendar Year 2009 and First Two Quarters of Calendar Year 2010	2	NTG values reported for 2 program-years: 2009 and 2010.
11. 2006-2008 Evaluation Report for PG&E Fabrication, Process and Manufacturing Contract Group	1	N/A
12. Evaluation of the Southern California Gas Company 2004-2005 Non-Residential Financial Incentives Program	1	N/A
13. Comprehensive Process and Impact Evaluation of the Business Heating Efficiency Program - Colorado	1	N/A

Document Number and Title	Number of Distinct Values Reported	Reason for Including Multiple Values
14. New Jersey's Clean Energy Program Energy Impact Evaluation: SmartStart Program Impact Evaluation	1	N/A
15. Commercial and Industrial Energy Efficiency Retrofit Custom Programs Portfolio Evaluation	1	N/A
16. Focus on Energy Evaluation: Business Programs – Additional Looks at Attribution	1	N/A
17. Focus on Energy Evaluation: Semiannual Report (Second Half of 2009)	1	N/A
18. Focus on Energy Evaluation: Semiannual Report (First Half of 2009)	1	N/A
19. Achieving Natural Gas Savings Goals: Commercial Heating Programs Heat It Up	1	N/A
Total: 19 Documents Reviewed, 38 Distinct Values Reported		

Source: Navigant analysis.

Navigant reviewed these selected documents to summarize methods used to assess NTG values across these jurisdictions. The following estimates from these studies are reported:

- Net-of-free ridership = 1- FR,
- Net-of-free ridership and participant spillover = 1 – FR + PSO, and
- Net-of-free ridership and all spillover = 1- FR + PSO + NPSO
  (Note: NPSO is non-participant spillover)

This approach conveys information on NTG values based on the common definitions across these studies, and avoids inappropriate comparisons that could result from comparing the studies' reported NTG values when they include different components. Table 2 presents the distribution of the different NTG factors reported across the 38 distinct values.

Table 2. NTG Values Reported

	NTG Values Reported by Adjustment Factor Included	Net-of-NTG Factors
FR	28	38
FR & PSO	3	10
FR, PSO & NPSO	7	7

Source: Navigant analysis.

A total of 28 NTG values reported adjust for FR only, 3 adjust for FR and PSO, and 7 adjust for FR, PSO, and NPSO. The last column shows the information gained from presenting net-of-NTG component values. For example, all 38 of the NTG values reported include values for FR.

Rather than just present the NTG values that adjust for FR only (n=28), the net-of-NTG component values are presented. In this case, (1 – FR) (n=38).[6]

In addition to these studies, Navigant also reviewed the 2008 evaluation of Union and Enbridge's custom projects program conducted by Summit Blue Consulting.[7]

2.4 Assessing Options for NTG

Given the uncertainty around NTG values, Navigant applied Decision Analysis methods to illustrate the risks faced by utilities and ratepayers when NTG values are uncertain and provide information on the benefits and costs of choosing one approach to net savings over another.

Navigant took the following steps to conduct the Decision Analysis:

1. Define the benefits of accurate (and costs of inaccurate) NTG values in a general context.
2. Narrow the focus the analysis on the benefits/costs for which Navigant had access to data; specifically, the incentives paid to utilities based on the estimated net savings (m^3) achieved by custom programs.
3. Establish a baseline against which a sensitivity analysis can be conducted where a selected NTG value is assumed to be correct, but in fact is incorrect by some margin of error.[8] The sensitivity analyses were conducted independently by Union and Enbridge and were not verified by Navigant.
4. Conduct a "value of information" analysis by examining the change in incentive payments resulting from better information on NTG values compared to the cost of obtaining the information (e.g., through NTG research).

In addition, Navigant organized the results of the Decision Analysis to provide insight into the tradeoffs from using different approaches to setting an NTG value, ranging from transferring values based on the jurisdictional review to conducting NTG research.

The next section (Section 3) presents an overview of the Union and Enbridge C&I programs to provide context. Following this program overview, Section 4 discusses the regulatory approach and methodological approach to NTG used by different jurisdictions followed by a review of researched NTG values in selected jurisdictions (Section 5). Finally, Section 0 presents the decision analysis for assessing alternate approaches to NTG.

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[6] Because the documents reviewed contain varying degrees of detail and explanation, the Navigant team applied its best interpretation of these documents to synthesize the available information in a consistent manner.

[7] Summit Blue Consulting. 2008. *Custom Projects Attribution Study.* Union Gas Limited and Enbridge Gas Distribution, October 27, 2008.

[8] These first three steps are part of a "loss function" analysis which identifies the costs of selecting one NTG value when another value is the actual value.

3. Overview of Union and Enbridge Custom Programs

Union and Enbridge have been delivering natural gas DSM programs for over 10 years, including custom programs for the C&I sectors. This section provides an overview of these programs.

3.1 Union Custom Programs

Union offers the Custom Savings Program to C&I customers. Within the custom program umbrella there are numerous program offerings providing a combination of technical assistance and financial incentives:

- **Engineering Feasibility Study.** These comprehensive engineering analyses and assessments include both whole facility and end-use focused studies. Example projects include thermal surveys, HVAC audits, energy audits, and energy benchmarking.
- **Steam Trap Survey.** These studies focus exclusively on the use and efficiency of steam traps, and seek efficiencies in the discharge of condensation, air, and other non-condensable gases without losing steam.
- **Process Improvement Study.** This offering targets industrial facilities through comprehensive process improvement studies conducted by industry-specific production and energy utilization experts. Example projects include steam plant audits, process integration analyses, heating integration studies, and process operation improvement studies.
- **Integrated Energy Management Systems.** This program offering provides technical assistance and financial incentives to industrial customers for the installation of an integrated management system.
- **Customer Education.** This program provides education, training, and technical assistance to C&I customers.
- **New Equipment.** Technical assistance and financial incentives are provided to C&I customers to support the installation of new energy efficient equipment and processes. Examples of measures include furnaces, HVAC, heat recovery, controls, insulation, and building envelope.
- **Runsmart Building Optimization.** Technical assistance and financial incentives are provided to commercial customers (e.g., education, healthcare, offices, multi-unit residential, and entertainment) for building optimization. Examples of projects include verifying dampers and valves on air handling units, calibrating sensors and instrumentation, and insulation.

- **Operation and Maintenance.** This program offering provides technical assistance and financial incentives to C&I customers for operation and maintenance of existing measures. Typical projects include repairs to HVAC systems, hot water systems, insulation repairs, and steam system repairs.
- **Boiler Tune-Up.** Technical assistance and financial incentives are provided to industrial customers for a boiler tune-up. Boilers must have output of less than 25,000 pounds per hour or 800 BHP.
- **Meters.** Technical assistance and financial incentives are provided to industrial customers for the installation of natural gas, steam, or hot-water meters.
- **Infrared Anti-Condensate Plastic.** This program offering provides technical assistance and financial incentives to industrial customers for the installation of infrared anti-condensate plastic for a greenhouse.
- **Demonstration of New Technologies.** Technical assistance and financial incentives are provided to C&I customers for adopting new technologies that save natural gas.

3.2 Enbridge Custom Programs

Enbridge offers two custom C&I programs:

- **Commercial Custom Savings Program** provides both technical assistance and financial incentives to medium to large-sized new and existing commercial customers for energy efficient custom gas projects. Examples of custom measures include boilers, building automation systems, variable frequency drives, and demand control ventilation.
    1. The *Existing Buildings* program offering primarily focuses on projects with multiple technologies and requires technical assistance throughout the development of the project.
    2. Two new initiatives, launched in 2012, (*Energy Compass and Run It Right*) encourage a continuous improvement strategy for large commercial customers. These program offerings provide technical assistance by offering an energy efficiency diagnostic service and assisting with the implementation of low and no-cost operational improvements.
- **Industrial Continuous Energy Improvement Program** aims to reduce the natural gas use of medium to large-sized industrial customers through a continuous improvement approach. This approach includes five steps, providing both technical assistance and financial incentives for the implementation of energy efficiency projects:
    1. *Knowledge Development* involves educating customers through workshops and publications.
    2. *Opportunity Identification* involves providing technical assistance to customers in identifying energy efficiency opportunities.

3. *Measurement* provides technical assistance to identify and measure the information needed to make a decision regarding energy efficiency opportunities. Financial incentives are available for measurement equipment.
4. *Engineering Analysis* provides technical assistance to customers in quantifying the benefits and costs associated with an energy efficiency opportunity. Financial incentives are available if a third party consultation is required.
5. *Action and Implementation* provides technical assistance and financial incentives for energy efficiency projects.

Examples of projects include industrial process heat systems, steam systems, and heating and ventilation.

4. Approach to Net Savings

This section presents the findings from the jurisdictional review of the approach taken to net savings, as well as the availability of performance incentives. This section begins with a review of 42 jurisdictions in the United States and Canada, representing the vast majority of jurisdictions with ratepayer-funded energy efficiency programs. This is followed by a closer look at the nine jurisdictions selected for further review. The final section summarizes the findings that are most relevant to Union and Enbridge.

4.1 Jurisdictional Review

Table 3 presents a summary of the approach to net savings used in the 42 jurisdictions, including the treatment of a FR adjustment and whether spillover is considered.[9] The table also presents information on whether jurisdictions offer utility performance incentives for meeting their savings goals, though, as indicated below, these goals are linked to either *gross* or *net savings*. Following is a summary of key findings:

- One-third (33%) of the jurisdictions reviewed **do not adjust gross savings** for either FR or spillover; however, some of those states may conduct some NTG research to inform future program design. Half of the U.S. states that do not adjust gross savings provide performance incentives for utilities to achieve energy efficiency program goals or have a performance incentive pending.

- Relatively few (14%) of the jurisdictions reviewed use a **deemed approach** to NTG; the deemed NTG values may be determined at a portfolio level (ranging from 0.7 to 0.9) or on a measure-by-measure basis (as in California, Vermont, and Nevada). These deemed NTG values are typically developed after NTG research has been conducted through program impact evaluations, and are revised on a regular basis through negotiations between utilities and regulators (often informed by additional NTG research). Over three-quarters (83%) of the U.S. states that use a deemed NTG approach provide performance incentives for utilities to achieve energy efficiency program goals.

- Nearly half of all jurisdictions reviewed take a **research-based approach** to NTG analysis. The vast majority of those jurisdictions consider spillover in some capacity, at least for some program types, though spillover is still quantified much less often than FR. Both FR and spillover are most commonly estimated through a self-report (participant survey) approach, though econometric methods (e.g., billing analysis) and market share modeling approaches are occasionally used. Nearly three-quarters of the U.S. states that take a research-based NTG approach provide performance incentives for

[9] Note that within a given jurisdiction, the treatment of spillover may vary by program type (including whether participant, non-participant, or both types of spillover is researched), and evaluators may investigate the possibility of spillover but find that no spillover is occurring or that it cannot be quantified with enough precision to obtain regulatory approval. Thus, this column reflects jurisdictions which consider the possibility of spillover but have not necessarily quantified and received regulatory approval for spillover savings estimates.

utilities to achieve energy efficiency program goals or have a performance incentive pending.

Table 3. NTG Approaches, Treatment of Free Ridership and Spillover, and Availability of Performance Incentives by Jurisdiction

Jurisdiction	NTG Approach*	Free-Ridership Adjustment	Spillover Considered?	Performance Incentives?	Notes
Hawaii	Deemed (0.7)			Yes	
Arkansas	Deemed (0.8)			Yes	
Michigan	Deemed (0.9)			Yes	Some NTG research conducted but not currently required by regulators.
California	Deemed (varies by measure, 0.5 for custom gas measures)			Yes	Research conducted to inform deemed NTG values.
Nevada	Deemed (varies by measure)				Some NTG research conducted.
Vermont	Deemed (varies by measure)			Yes	
British Columbia	Researched	Yes	Yes		Deemed NTG of 1.0 used until researched.
Nova Scotia	Researched	Yes	Yes		
Colorado	Researched	Yes	Yes	Yes	
Connecticut	Researched	Yes	Yes	Yes	Gross savings are used to evaluate whether goals have been met.
Florida	Researched	Yes	Yes	Pending	
Georgia	Researched	Yes	Yes	Yes	
Illinois	Researched	Yes	Yes		
Indiana	Researched	Yes	Yes	Yes	
Kansas	Researched	Yes		Pending	
Maine	Researched	Yes	Yes		
Massachusetts	Researched	Yes	Yes	Yes	
Missouri	Researched	Yes	Yes	Pending	
New Hampshire	Researched		Yes	Yes	
New Mexico	Researched	Yes		Yes	

Jurisdiction	NTG Approach*	Free-Ridership Adjustment	Spillover Considered?	Performance Incentives?	Notes
New York	Researched	Yes	Yes	Yes	Deemed NTG of 0.9 used for programs without recent evaluations.
Oregon	Researched	Yes	Yes		
Pennsylvania	Researched	Yes	Yes		Gross savings are used to evaluate whether goals have been met.
Rhode Island	Researched		Yes	Yes	
Utah	Researched	Yes	Yes	Pending	
Wisconsin	Researched	Yes	Yes	Yes	
Wyoming	Researched	Yes	Yes		
Arizona	No NTG adjustment			Yes	
Delaware	No NTG adjustment				
District of Columbia	No NTG adjustment				
Idaho	No NTG adjustment			Pending	Some NTG research conducted but not required by regulators.
Iowa	No NTG adjustment				
Kentucky	No NTG adjustment			Yes	
Maryland	No NTG adjustment				
Minnesota	No NTG adjustment			Yes	
Nebraska	No NTG adjustment				
New Jersey	No NTG adjustment				
North Carolina	No NTG adjustment			Yes	
Ohio	No NTG adjustment			Yes	
Texas	No NTG adjustment			Yes	

Jurisdiction	NTG Approach*	Free-Ridership Adjustment	Spillover Considered?	Performance Incentives?	Notes
Washington	No NTG adjustment				Some NTG research conducted but not required by regulators.
South Dakota	Varies by utility	Yes	Yes		

* Deemed NTG values are pre-determined values typically developed after NTG research has been conducted through program impact evaluations. Researched NG values are most commonly estimated through a self-report (participant survey) approach, though econometric methods (e.g., billing analysis) and market share modeling approaches are occasionally used. *Source:* Navigant analysis of various resources including utility websites, regulatory agency websites, websites of research/advocacy groups, and studies that previously surveyed the approach to net savings (Appendix A).

4.2 *Selected Jurisdictions*

As noted in the Methodology section, Navigant reviewed a total of 19 documents that researched NTG. These documents represent nine jurisdictions, including: California, Colorado, Massachusetts, Minnesota, New Jersey, New Mexico, Oregon, Washington, and Wisconsin.

While documents that research NTG were identified, the approach to net savings in these selected jurisdictions varies as shown in Table 4. Most notably, three of the jurisdictions make no NTG adjustment and one jurisdiction deems NTG even though NTG research is being conducted. Also note that three of the nine jurisdictions do not have performance incentives.

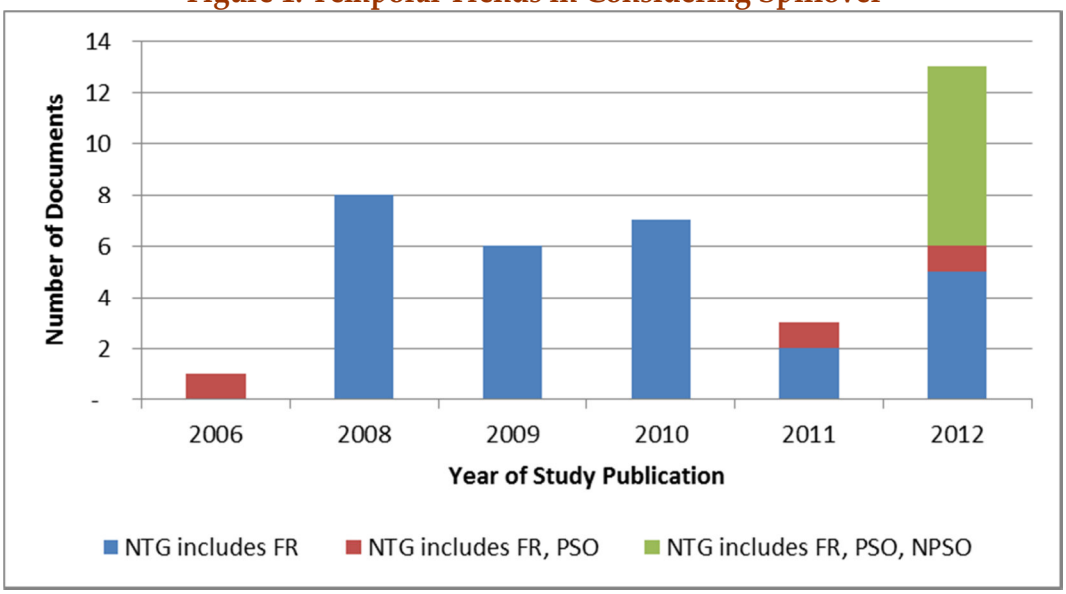
Table 4 . Approach to Net Savings in Selected Jurisdictions

Deemed	Researched Adjusts for Free Ridership and Spillover is Considered	No NTG Adjustment
California (0.5 for custom gas measures)	Colorado, Massachusetts, New Mexico (FR only), *Oregon*, and Wisconsin	Minnesota, *New Jersey*, and *Washington*

**Italics* indicate that the jurisdiction does not have performance incentives. *Source:* Navigant analysis.

Regional or temporal trends in whether participant and NPSO were also considered. Figure 1 presents the number of studies that include free-ridership, PSO, and NPSO by the year of study publication. Based on the sample of studies conducted in the selected jurisdictions, there is a clear trend towards including participant and NPSO in calculating NTG in recent years.

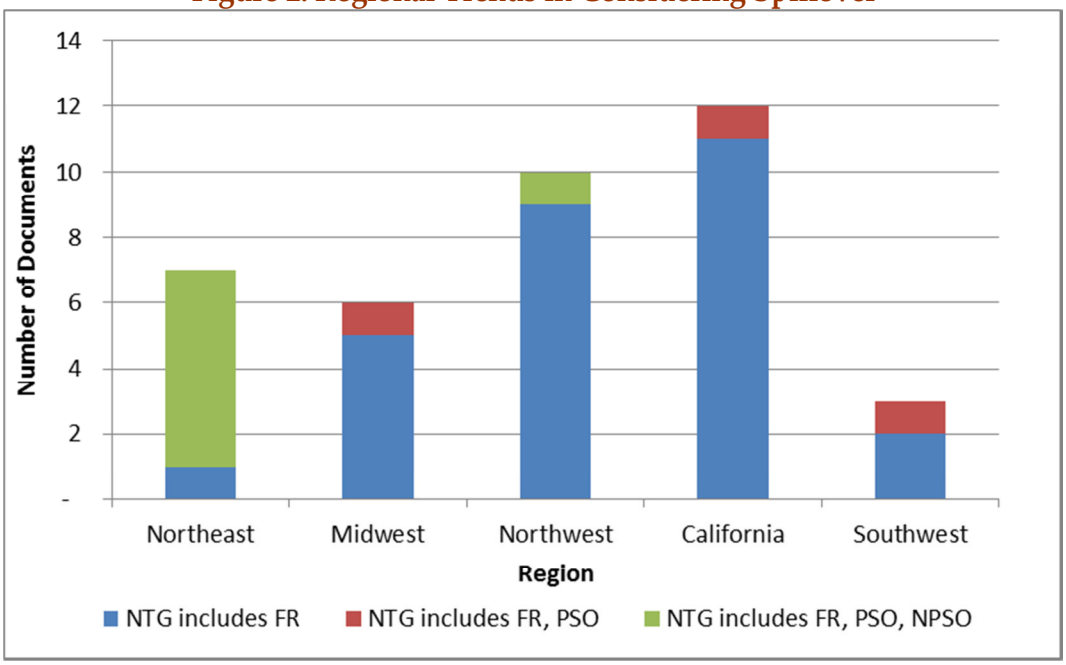
Figure 1. Temporal Trends in Considering Spillover



Source: Navigant analysis.

Figure 2 presents the number of studies that include free-ridership, PSO, and NPSO by region of the United States. Based on the sample of studies conducted in the selected jurisdictions, it appears that all regions consider PSO in calculating NTG values.

Figure 2. Regional Trends in Considering Spillover



Source: Navigant analysis.

4.3 Application to Union and Enbridge

Based on the jurisdictional review nearly half of the jurisdictions with rate-payer funded energy efficiency program conduct NTG research. Among the 33% that do not adjust gross savings some research is being conducted. For example, three of the nine jurisdictions selected for further review do not adjust gross savings while another one deems – yet NTG research is being conducted.

Trends in the included NTG factors are also identified. Among the nine selected jurisdictions there is a clear trend towards including both participant and NPSO in recent years, and that it is not a regional phenomenon. The next section of this report summarizes the researched NTG values resulting from the review of research conducted in the nine selected jurisdictions.

5. Researched NTG Values in Selected Jurisdictions

In this section Navigant summarizes the 38 NTG values reviewed in the nine selected jurisdictions. As described in Section 2.3, the NTG values presented are net-of-NTG factors. All values represent gas values, unless specified otherwise.

A summary of the studies' findings across the following categories are presented:

- First, a high level summary of the NTG values for non-residential natural gas programs is provided. To provide context for these values we examine how these values vary with the document number, region, program year, and the analytic rigor of the methodology used. We also provide a comparison of the natural gas NTG values to the electric NTG values reported in the same documents.
- Next, the NTG values based on a variety of program characteristics, including program type, customer segment, utility-type, region, approach to program marketing, and program maturity are summarized.[10]
- The final section summarizes the findings that are most relevant to Union and Enbridge.

Definitions

NTG values presented in this section represent "Net-of-NTG Factors."

- NTG value including free ridership, NTG = (1-FR),
- NTG value including free ridership and participant spillover, NTG = (1-FR+PSO), or
- NTG value including free ridership and spillover, NTG = (1-FR+PSO+NSPO), where NPSO represents non-participant spillover.

It is important to keep in mind that the NTG values presented in this section are the result of research conducted for different programs, in different program environments, and using different methodologies. As a result, interpretation of trends should be made with caution - differences in NTG values may reflect true differences in FR and spillover, or may simply reflect differences in evaluation methodologies, even among similar programs (Saxonis 2007).

5.1 Summary of NTG Values

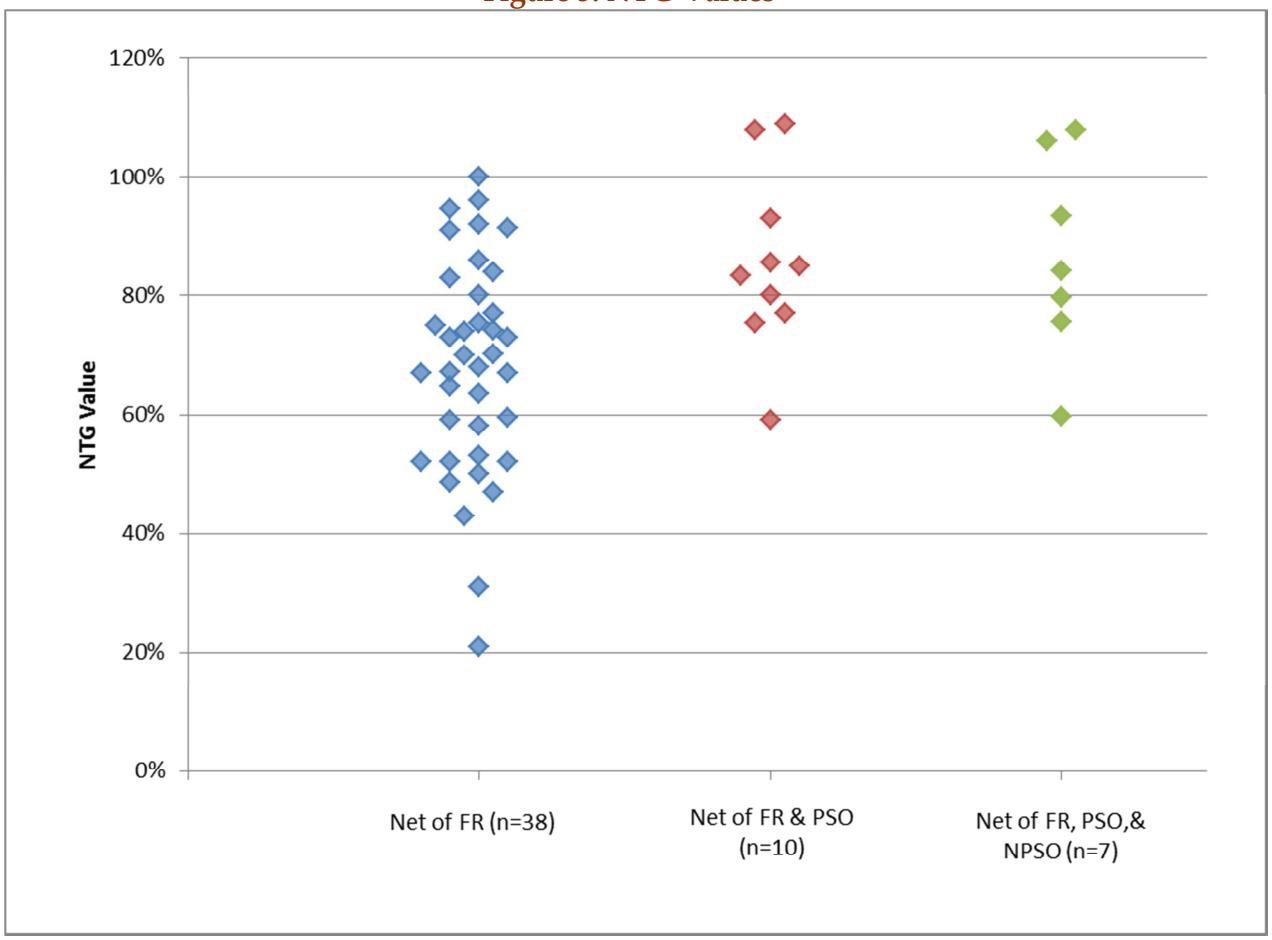
Figure 3 summarizes net of NTG component values.[11] Some key patterns are evident in this Figure:

[10] Summarizing NTG values by various categories limits the sample sizes. As a result, caution should be used in interpreting NTG values.

[11] By presenting net-of-NTG component values, a distinct result reported in a document may be represented by multiple data points in the figures below. For example, if free ridership, PSO, and NPSO are considered, three data points will appear in the figure: the net-of-FR value, the net-of-FR & PSO value, and the net-of-FR, PSO & NPSO value.

- While the dispersion of net-of-free ridership values is quite large, ranging from 21% to 100%, the majority of values appear to "cluster" between 40% and 90%.
- There are only a few studies at the extremes of the range of net-of-free ridership values. One result reports high levels of free-ridership (79%) with another reporting zero free-ridership.[12]
- The average net-of-free ridership value is 68%.
- As expected, NTG values are larger when considering spillover. Average net-of-free ridership & PSO value is 86% and average net-of-free ridership & spillover value is 87%, suggesting that NPSO is small for non-residential gas programs.[13]

Figure 3. NTG Values



Source: Navigant analysis. Note that the sample size (n) represents the number of unique NTG values (program-utility-year combinations) reported in the 19 studies.

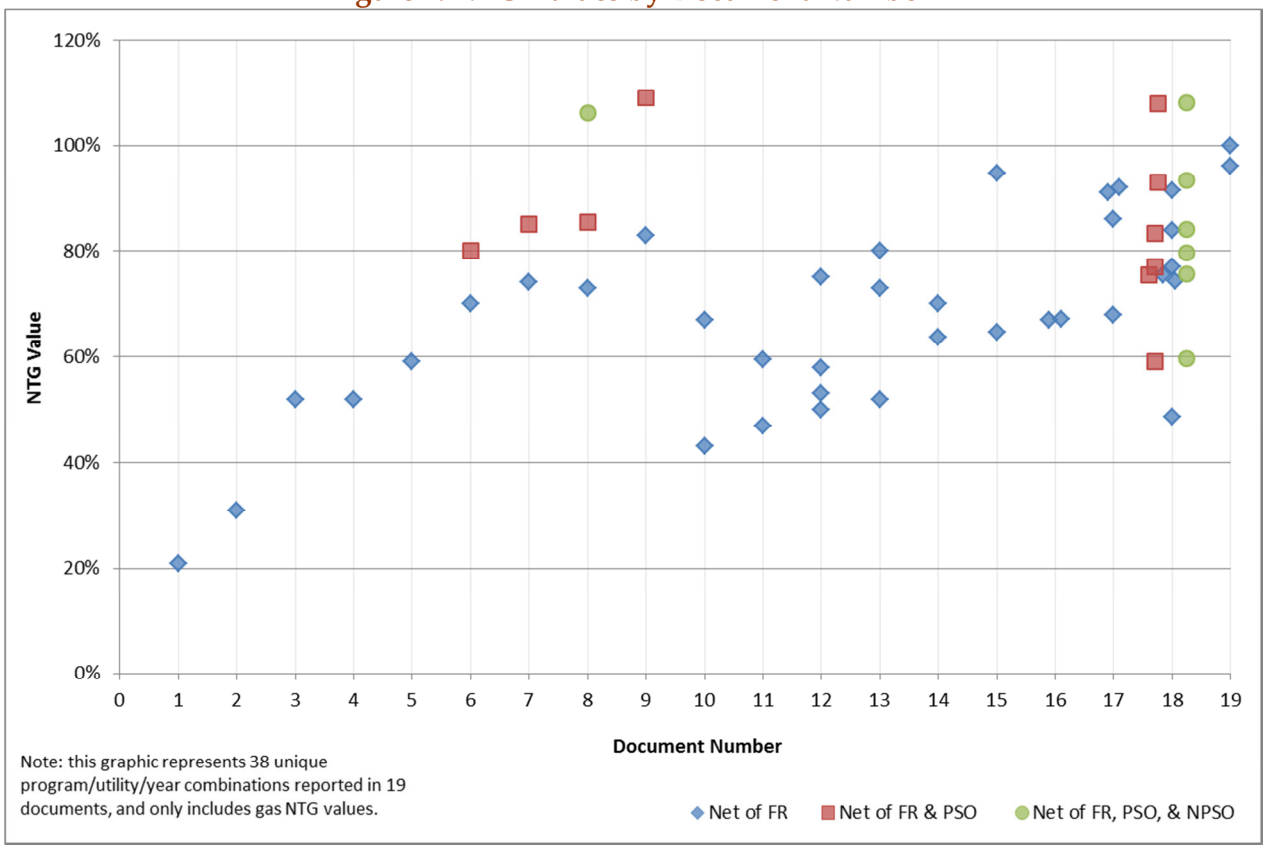
[12] Zero free-ridership was reported for a small pilot program (n=30) offering custom and prescriptive incentives targeted at K-12 school districts. 79% free-ridership was reported for a retrofit program in its third program year. The sample size (n=18) represents 75% of participants with natural gas measures and 10% of total program participants. Both studies relied on self-report methods.

[13] 5 of the 7 data points for NPSO report values of less than 1% with another reporting 2.6% (all values reported by the same study). The remaining data point reports NPSO of 21% with a corresponding PSO value of 13%).

To further examine trends in NTG values, Figure 4 summarizes the distinct NTG values reported by each document. There are two key findings:

- Only two documents report net-of-FR values below 40%.
- Net-of-FR values that exceed 90% are reported by just four documents and generally exhibit a clustering of multiple values. For example, document number 19 reports two distinct NTG values, both of which are larger than 90%.

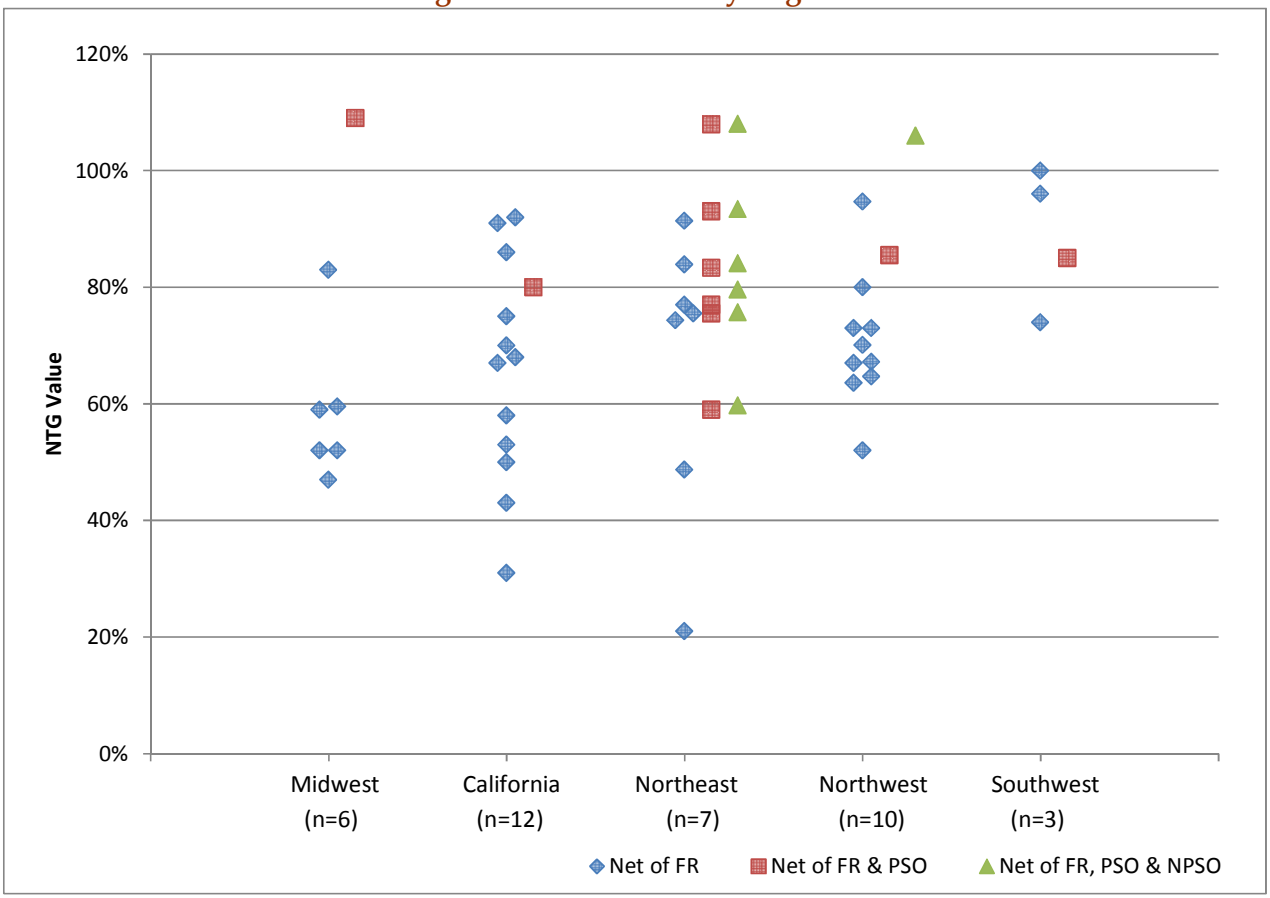
Figure 4. NTG Values by Document Number



Source: Navigant analysis.

Figure 5 summarizes NTG values by region. No clear regional trends emerge except it appears there is a clustering of net-of-FR values in the Northwest around 70%. These values represent evaluations of multiple program-years of two programs, with evaluations conducted by multiple evaluators.

Figure 5. NTG Values by Region

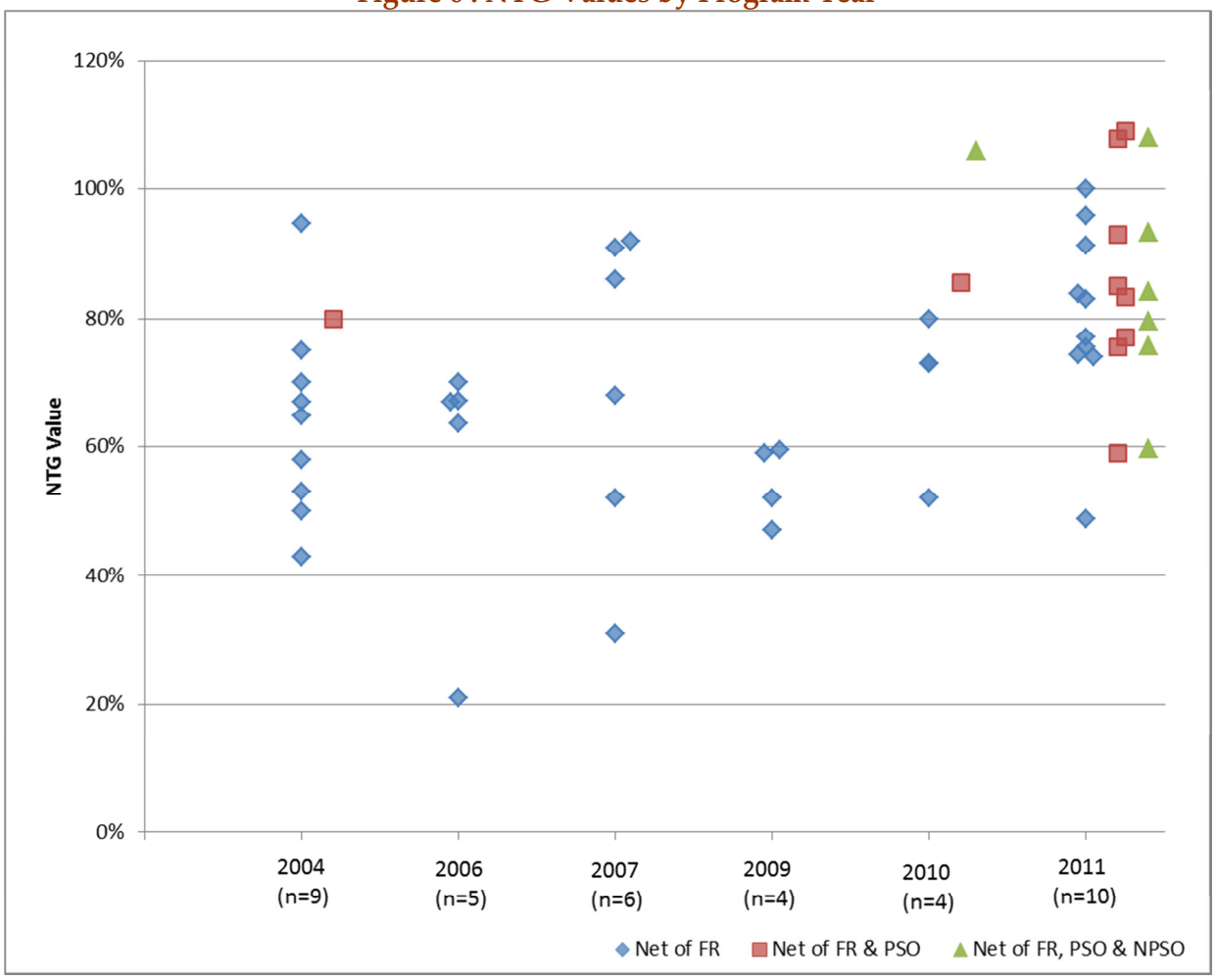


Source: Navigant analysis. Note that the sample size (n) represent the number of unique NTG values (program-utility-year combinations) in each region; the number of data points in the figure exceed the sample sizes because NTG findings are presented as net-of-free ridership, net-of-free ridership & PSO (if applicable), *and* net-of-free ridership, PSO & NPSO (if applicable).

Economic conditions may influence NTG values though few longitudinal studies have been conducted to reveal with certainty how FR and spillover are influenced. Saxonis (2007) identifies research conducted in the 1990's that suggest FR is lower during economic downturns. To ensure that trends in NTG values are not driven by specific economic conditions, Navigant explored whether NTG values vary by program year in Figure 6.[14] While there is a slight upward trend in the net-of-FR estimates, it is not large enough to cause concern about using average values if the TEC decides to do so.

[14] When two program years were evaluated, the first program year is used. For example, if a study evaluates program years 2004-2005, the NTG value is recorded for 2004.When three program years were evaluated, the middle program year is used. For example, if a study evaluates program years 2006-2008, the NTG value is recorded for 2007.

Figure 6 . NTG Values by Program Year



Source: Navigant analysis. Note that the sample size (n) represent the number of unique NTG values (program-utility-year combinations) by program year; the number of data points in the figure exceed the sample sizes because NTG findings are presented as net-of-free ridership, net-of-free ridership & PSO (if applicable), *and* net-of-free ridership, PSO & NPSO (if applicable).

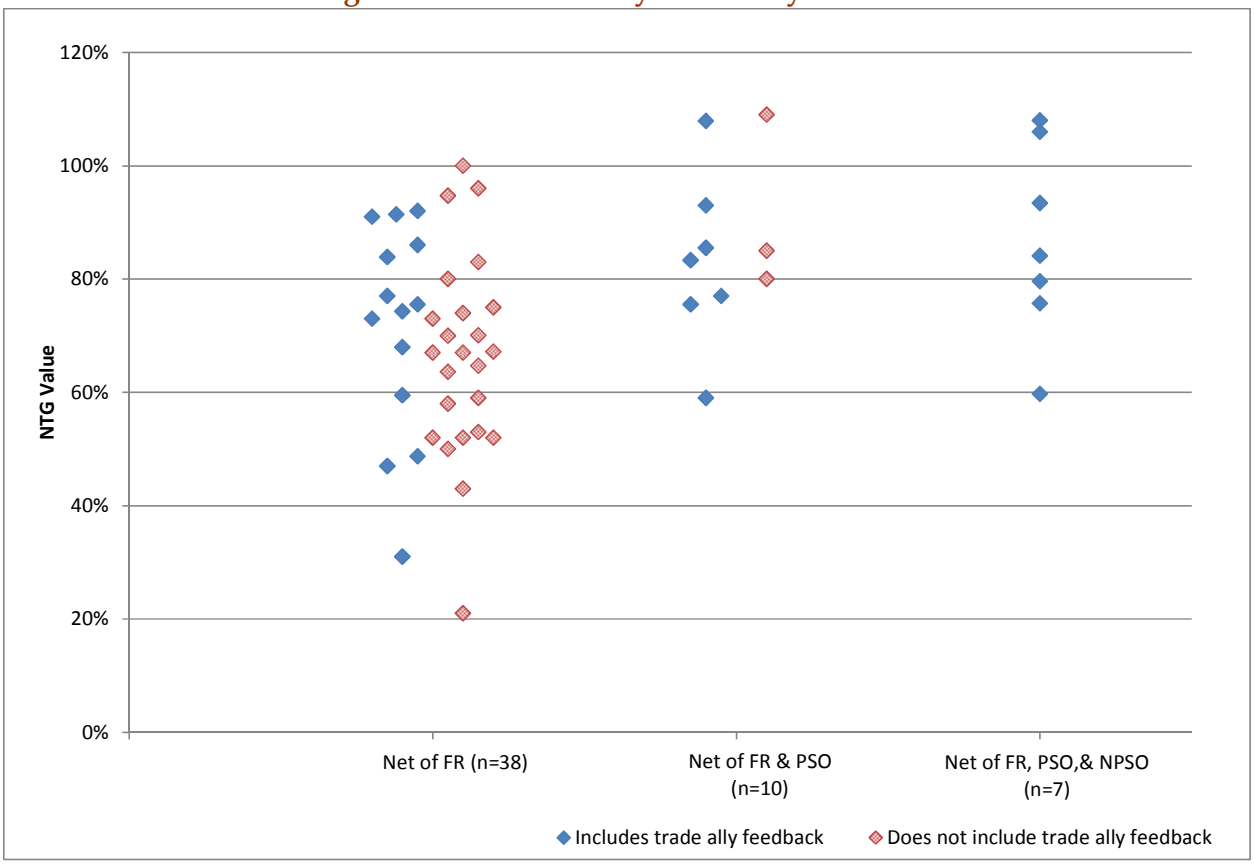
To provide further context to this summary of NTG values Navigant explored whether there are trends in NTG values based on the analytic rigor of the methodology, but were limited in our efforts due to a lack of data. For example, the sample size for most of the results was identified, but the documents did not report population size or the fraction of energy savings that the sample size represents. Without context for the sample size, information on how NTG values vary with sample size provides little insight.[15]

Instead, Navigant uses a proxy for the analytic rigor of the methodology based on data that is available, namely, whether the evaluators used enhanced self-report methods in the form of trade ally feedback. Figure 7 summarizes NTG values differentiating between whether trade ally feedback was incorporated in the NTG calculation. Net-of-free ridership values appear to

[15] Refer to Appendix D for information on sample size.

cluster at slightly larger values when incorporating trade ally feedback. This is not unexpected as trade ally feedback often decreases FR because trade allies have more insight about the full extent of the program's influence on the market.

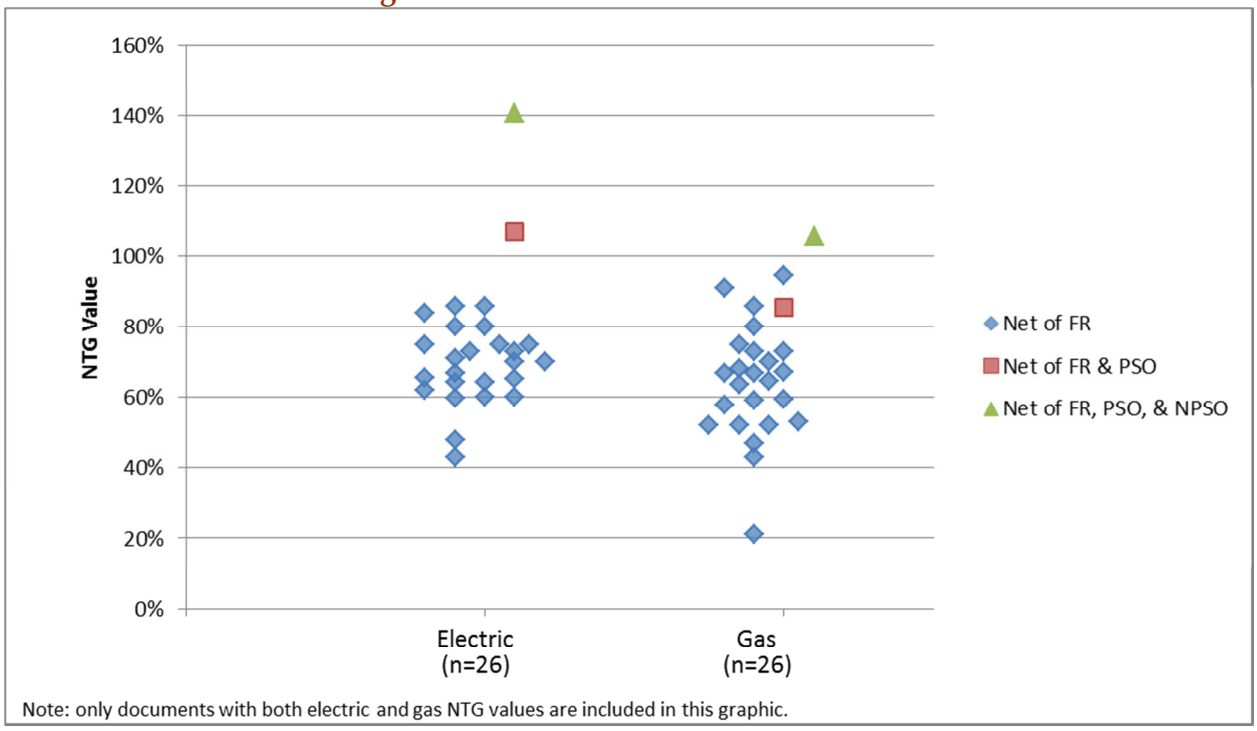
Figure 7. NTG Values by Trade Ally Feedback



Source: Navigant analysis. Note that the sample size (n) represents the number of unique NTG values (program-utility-year combinations) reported in the 19 studies.

Comparing gas NTG values to electric NTG values may also provide additional insight. Many of the documents reviewed target both electric and gas measures, but report NTG values for electric and gas measures separately. Figure 8 compares electric NTG values to gas NTG values for those documents that report both electric and gas NTG values. Net of FR values appear to cluster for both gas and electric, but the clustering of gas values is slightly wider than electric. Average net-of-free ridership values are similar, 69% for electric and 65% for gas.

Figure 8. Electric versus Gas NTG Values



Source: Navigant analysis. Note that the sample size (n) represent the number of unique NTG values (program-utility-year combinations) for each fuel type; the number of data points in the figure exceed the sample sizes because NTG findings are presented as net-of-free ridership, net-of-free ridership & PSO (if applicable), *and* net-of-free ridership, PSO & NPSO (if applicable).

The following section examines whether NTG values vary by features of program design and delivery.

5.2 *Summary Based on Program Characteristics*

In this section, Navigant summarizes NTG values based on various characteristics of program design and delivery. In particular, variation in NTG values is examined based on:[16]

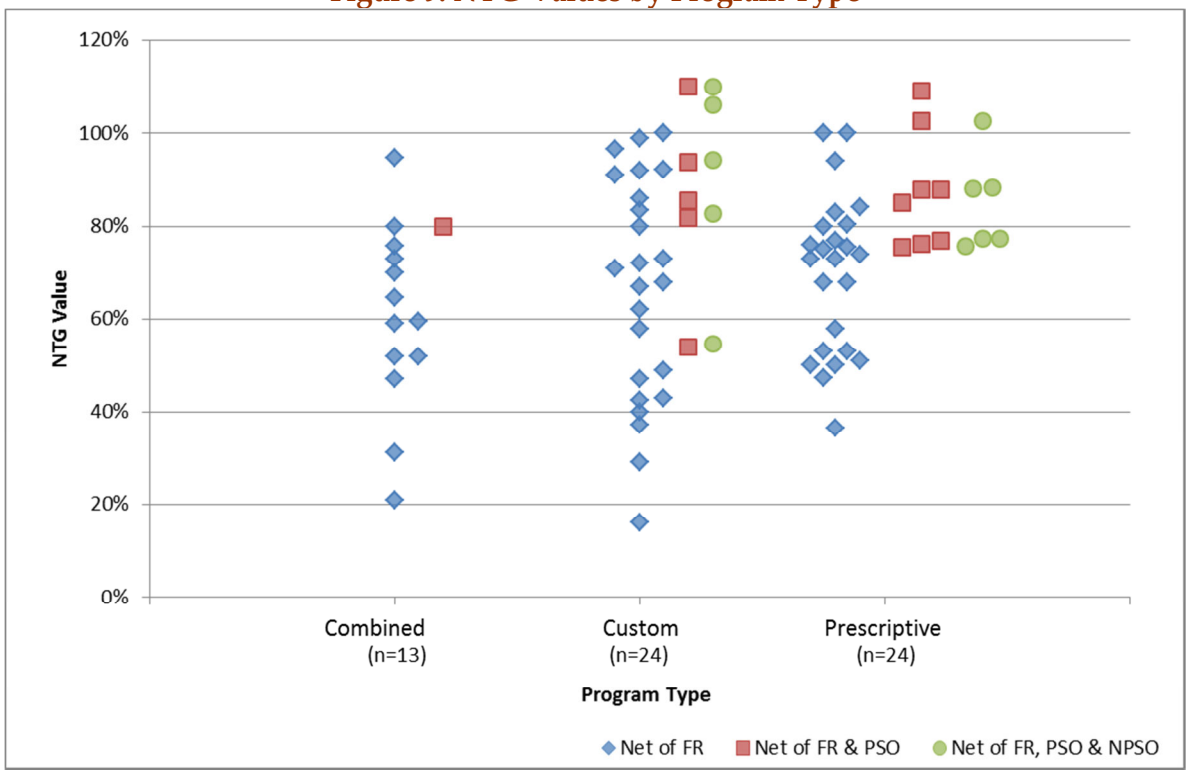
1. **Program-type**, differentiating between custom, prescriptive, and both.
2. **Customer segment**, differentiating between commercial, industrial, agricultural, institutional, and multi-sector.
3. **Utility-type,** differentiating between utilities/organizations that offer electric and gas versus those that offer gas-only.
4. **Program maturity,** differentiating by the number of years since program inception.

[16] Navigant explored other characteristics of program design, such as incentives as a percent of incremental cost, extent of design assistance throughout the program, program objectives, and more, however, because most studies did not provide this level of detail on the programs they were not included in the analysis.

5. **Program marketing strategy**, differentiating between a direct marketing/outreach, channel/partners, and both.

Figure 9 summarizes NTG values by program type (custom, prescriptive, or both).[17] Custom net-of-FR values exhibit a wider dispersion relative to prescriptive values. Excluding some outlier custom values, the ranges are fairly similar but the prescriptive values exhibit more clustering between 50% and 85%, whereas custom values do not appear to cluster in any particular range of values.

Figure 9. NTG Values by Program Type



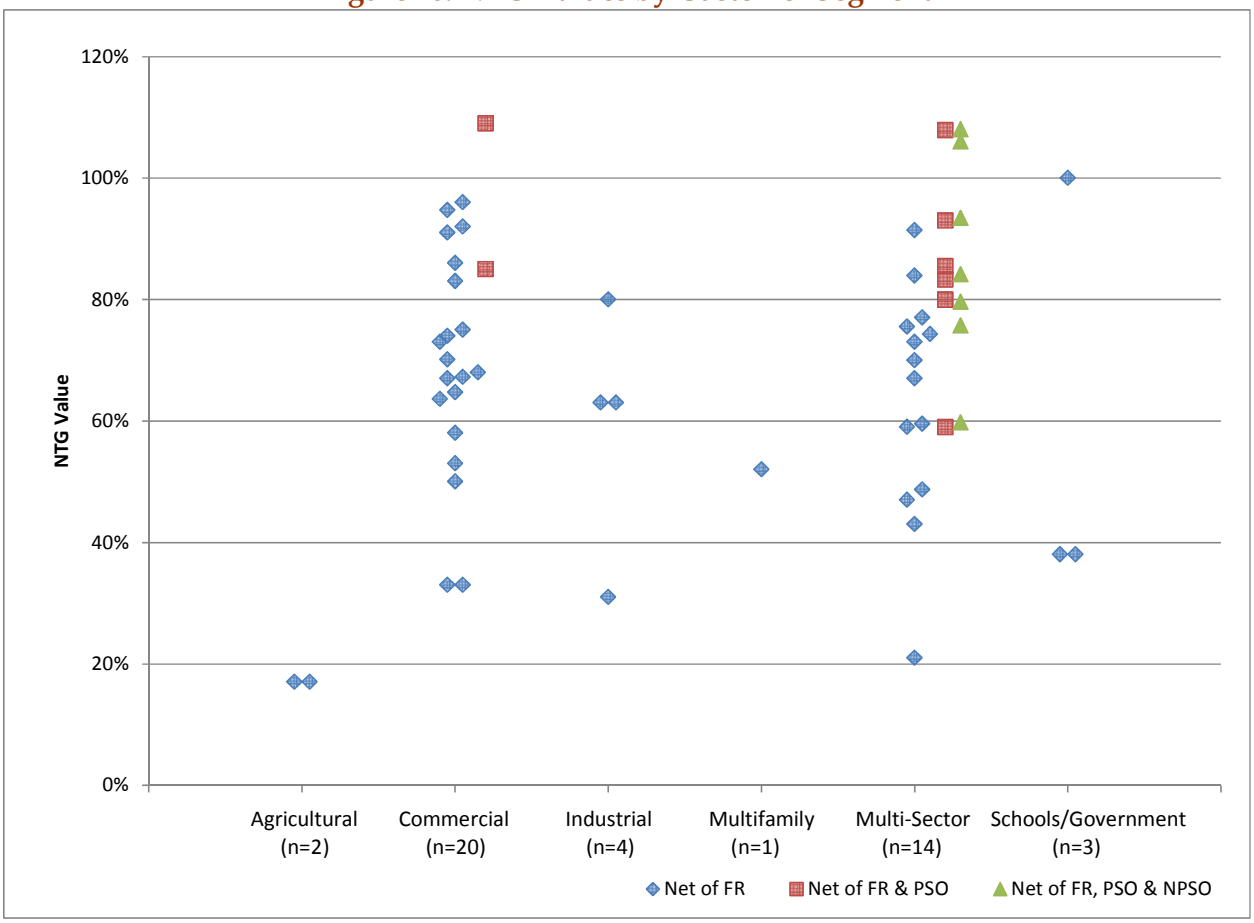
Source: Navigant analysis. Note that the sample size (n) represent the number of unique NTG values (program-utility-year combinations) for each program type; the number of data points in the figure exceed the sample sizes because NTG findings are presented as net-of-free ridership, net-of-free ridership & PSO (if applicable), *and* net-of-free ridership, PSO & NPSO (if applicable).

Figure 10 summarizes NTG values by customer segment.[18] Most of the programs included in this review are targeted at the commercial sector or are classified as multi-sector programs. While there is a wide dispersion of NTG values, the majority of values are found within the 60% and 80% range.

[17] In an effort to identify whether there are trends in NTG values by program type, when a NTG value was disaggregated into custom and prescriptive categories, these NTG values were included separately, resulting in a total of 61 data points for this analysis.

[18] In an effort to identify whether there are trends in NTG values by customer segment, when a NTG value was disaggregated into customer segments, these NTG values were included separately, resulting in a total of 44 data points for this analysis.

Figure 10. NTG Values by Customer Segment

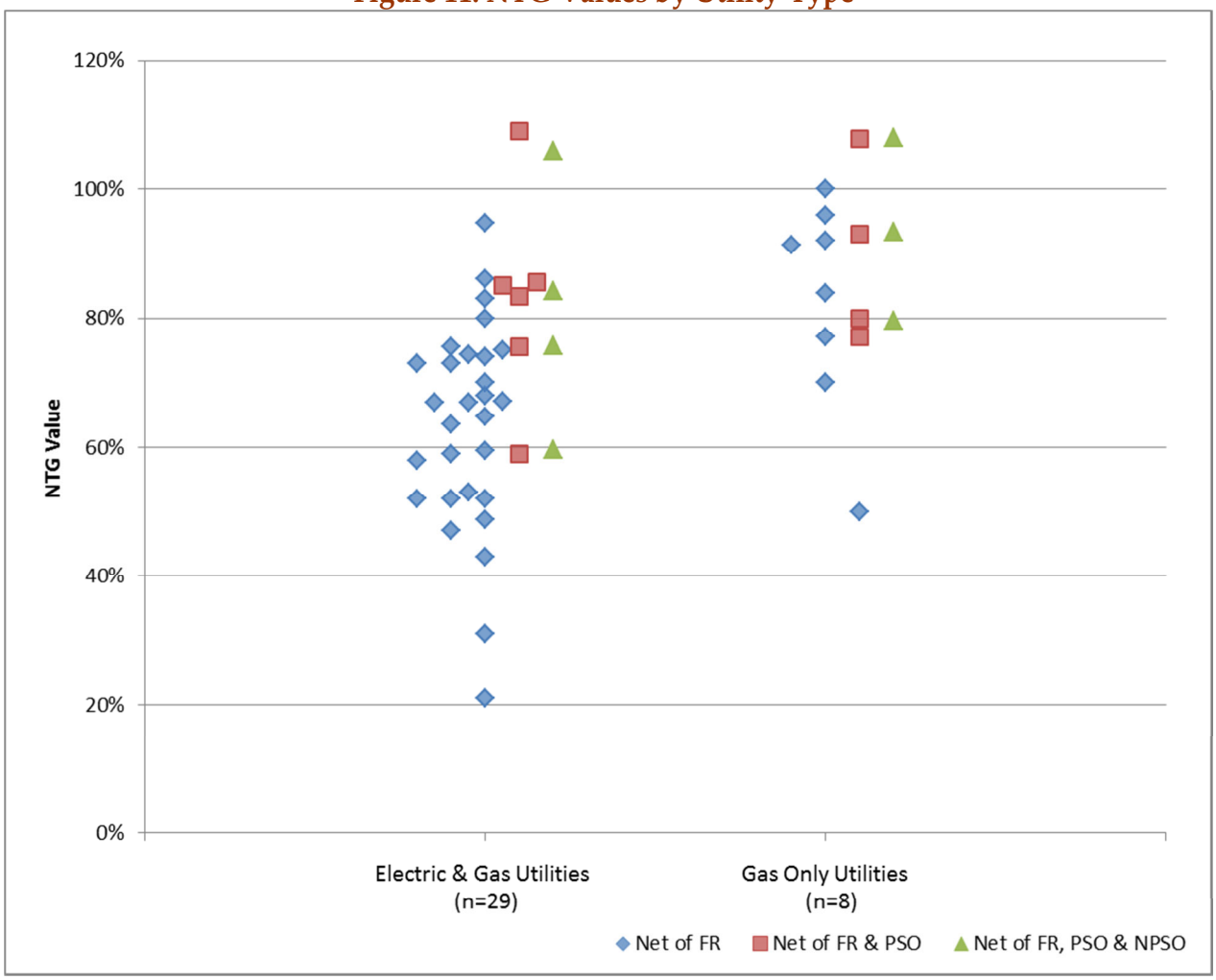


Source: Navigant analysis. Note that the sample size (n) represent the number of unique NTG values (program-utility-year combinations) for each segment; the number of data points in the figure exceed the sample sizes because NTG findings are presented as net-of-free ridership, net-of-free ridership & PSO (if applicable), *and* net-of-free ridership, PSO & NPSO (if applicable).

Figure 11 summarizes NTG values by utility-type (e.g., gas only, electric and gas).[19] Of the documents reviewed, more programs are offered by electric and gas utilities relative to gas-only. With only a few distinct net-of-FR values for gas-only utilities, comparisons across utility-types should be made with caution. Nevertheless, there appears to be a trend of lower FR and higher NTG values for programs offered by gas-only utilities.

[19] Note that the values presented are gas NTG values.

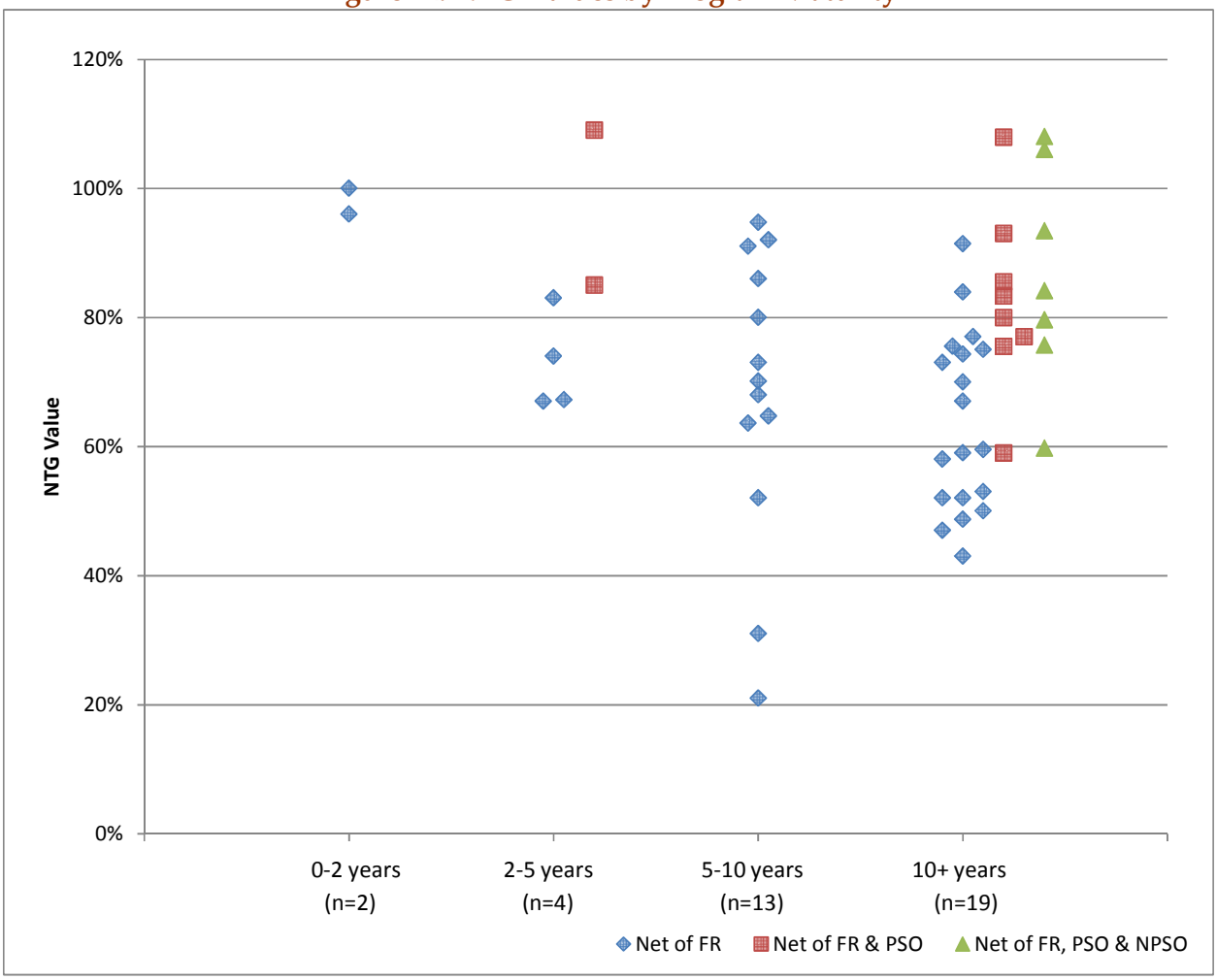
Figure 11. NTG Values by Utility-Type



Source: Navigant analysis. Note that the sample size (n) represent the number of unique NTG values (program-utility-year combinations) for each utility-type; the number of data points in the figure exceed the sample sizes because NTG findings are presented as net-of-free ridership, net-of-free ridership & PSO (if applicable), *and* net-of-free ridership, PSO & NPSO (if applicable). Total sample size is 37 instead of 38 because one utility is electric only but reported NTG values for gas savings from electric programs, specifically a retrofit program.

Navigant also explored whether NTG values varied with program maturity and program marketing strategy. Figure 12 summarizes NTG values by program maturity. The majority of programs are in at least their fifth program year, and while the sample size of programs with less than 5 years' experience is limited, there appears to be a trend of lower NTG values (and higher FR) as program experience increases. This finding is not unexpected as markets transform over time raising awareness and knowledge of the benefits of energy efficiency among potential resulting in higher degrees of FR. Jurisdictions which only adjust for FR can be especially prone to declining NTG values over time because what appears like FR in a program's later years may actually be evidence of spillover or market transformation from the program's earlier market interventions.

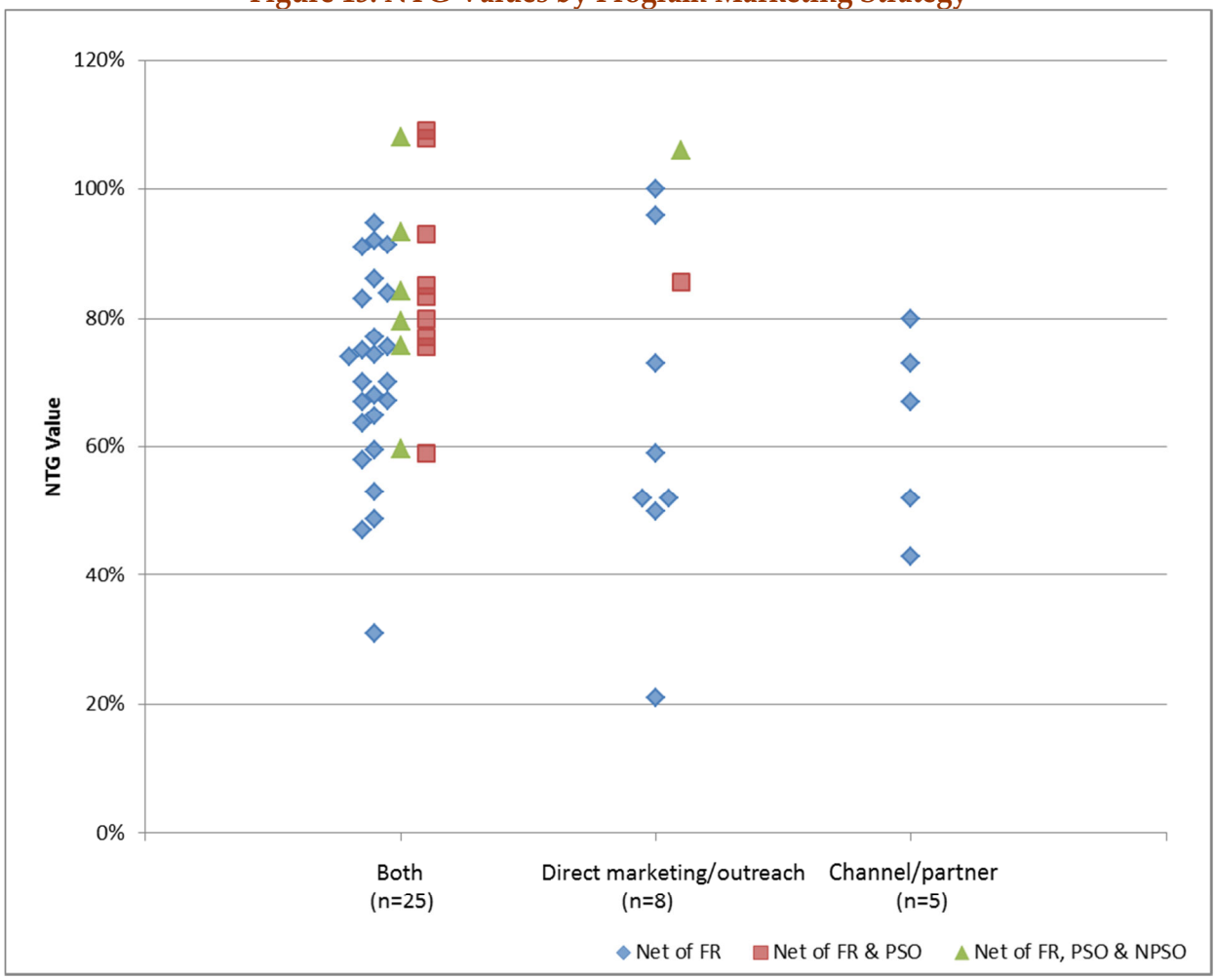
Figure 12. NTG Values by Program Maturity



Source: Navigant analysis. Note that the sample size (n) represent the number of unique NTG values (program-utility-year combinations) by program maturity; the number of data points in the figure exceed the sample sizes because NTG findings are presented as net-of-free ridership, net-of-free ridership & PSO (if applicable), *and* net-of-free ridership, PSO & NPSO (if applicable).

Figure 13 summarizes NTG values by program marketing strategy. The majority of programs adopted both a direct marketing/outreach strategy and a channel/partner strategy. As a result, the distribution of NTG values is similar to the high-level summary depicted in Figure 3. Note that the extreme net-of-FR values of 100% and 21% are for programs with a direct marketing/outreach strategy.

Figure 13. NTG Values by Program Marketing Strategy



Source: Navigant analysis. Note that the sample size (n) represent the number of unique NTG values (program-utility-year combinations) by program marketing strategy; the number of data points in the figure exceed the sample sizes because NTG findings are presented as net-of-free ridership, net-of-free ridership & PSO (if applicable), *and* net-of-free ridership, PSO & NPSO (if applicable).

5.3 *Application to Union and Enbridge*

In 2007-2008 Navigant (formerly Summit Blue Consulting) conducted the first attribution study of Union and Enbridge's custom C&I programs to evaluate FR and spillover effects. Table 5 presents the NTG values as well as the values of the individual NTG components.[20]

[20] Non-PSO was also researched but was not factored into the NTG ratio because the energy savings could not be calculated accurately.

Table 5. Summary of Attribution Analysis

Utility	Sector	NTG	Free Ridership	Participant Spillover
Union	**Total**	**56%**	**54%**	**10%**
	Agriculture		0%	
	Commercial Retrofit		59%	
	Industrial		56%	
	Multifamily		42%	
	New Construction		33%	
Enbridge	**Total***	**79%**	**41%**	**21%**
	Agriculture		40%	
	Commercial Retrofit		12%	
	Industrial		50%	
	Multifamily		20%	
	New Construction		26%	

*Free ridership and spillover values include rounding error.
Source: Summit Blue Consulting. 2008. *Custom Projects Attribution Study.* Union Gas Limited and Enbridge Gas Distribution, October 27, 2008.

Following the study, the OEB approved the FR adjustment, but did not approve a spillover value. Currently, Union uses one NTG value for all C&I custom programs, the researched net-of-free ridership value calculated across all sectors (i.e., a FR of 54% and a net-of-free ridership value of 46%). Enbridge, on the other hand, currently uses the researched sector-specific net-of-free ridership values.

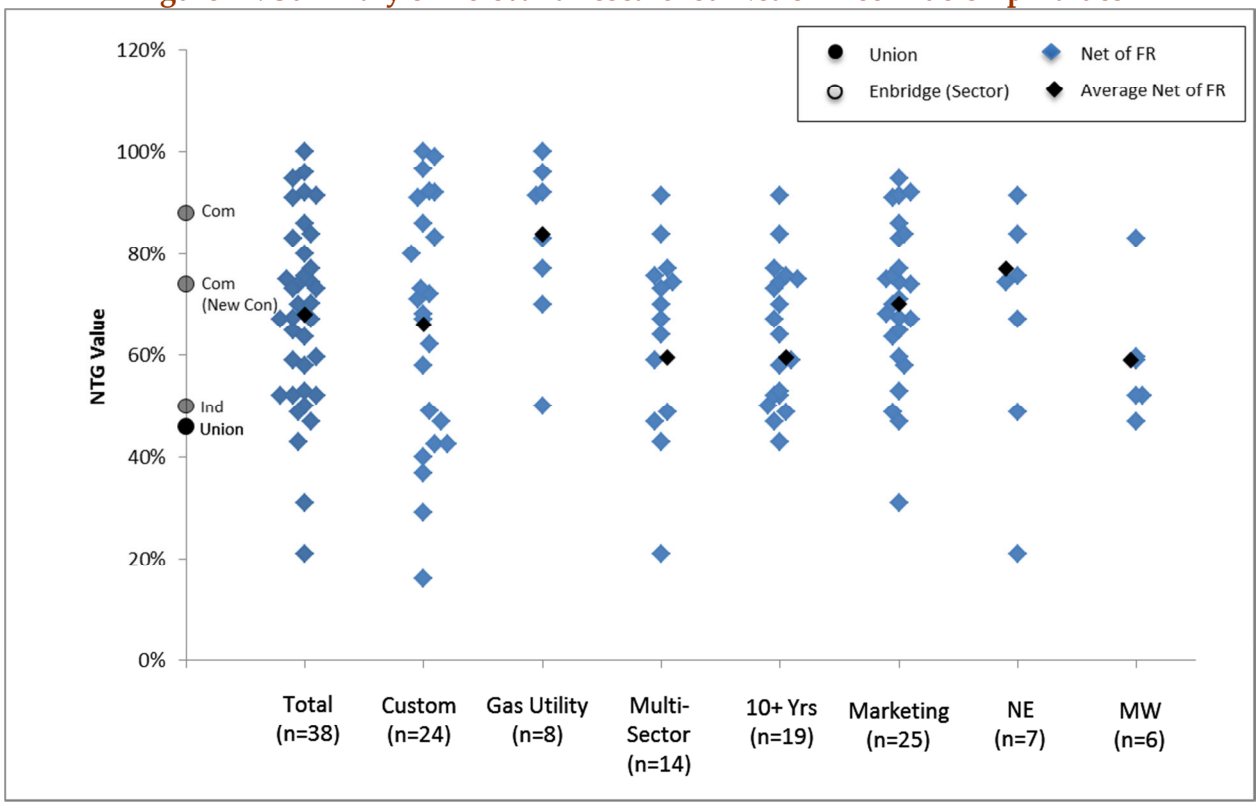
Comparing the current net-of-free ridership values for C&I custom programs (i.e., the researched net-of-free ridership values from the 2007-2008 Union and Enbridge study) to the range of researched values from the jurisdictional review provides context for the current net-of-free ridership values and insight into whether information available from other jurisdictions can be used to estimate NTG values in Ontario. Figure 14 summarizes findings from the review of researched NTG values in selected jurisdictions that are most relevant to Union and Enbridge.[21]

Union and Enbridge are gas-utilities that have been offering custom programs to commercial, industrial, or multi-sector customers for more than 10 years using both a direct marketing and channel/partner marketing strategy. As a result, Figure 14 presents the researched net-of-free ridership values for the following categories: custom program, gas utility, multi-sector, 10+

[21] We only summarize net-of-free ridership values as this summary provides the most information due to the largest sample sizes. Summaries of net of FR and spillover values are presented in Appendix E. Trends resulting from the jurisdictional review of NTG values that consider spillover should be interpreted with caution due to the small sample sizes.

years since program inception, a combination of direct and channel/partner marketing strategy, and northern regions (Northeast and Midwest).[22]

Figure 14. Summary of Relevant Researched Net-of-Free Ridership Values



Source: Navigant analysis. Note that the sample size (n) represents the number of unique NTG values (program-utility-year combinations).

The main findings resulting from the review of researched NTG values include the following:

- The NTG values calculated for Union and Enbridge are within the range of NTG values summarized in the review.
- When considering non-residential natural gas programs, NTG values appear to "cluster" between 40% and 90%. Union's NTG value is below the average. Enbridge's NTG value for the commercial sector is above the average while the NTG value for the industrial sector is below the average.

This "clustering" of values becomes less defined when considering other features of program design or implementation that make the NTG values more comparable to Union and Enbridge. For example, the clustering of NTG values for non-residential *custom* gas programs exhibits a wider dispersion without distinct clustering patterns.[23]

[22] All programs evaluated in the Midwest were offered in Wisconsin.

[23] Recall that when a NTG value was disaggregated into custom and prescriptive categories, these NTG values were included separately, resulting in more data points.

6. Assessing Options for NTG

Gross savings can usually be estimated quite accurately, however, estimating net savings poses greater challenges. Given the uncertainty around any NTG value, in this section Navigant applies a Decision Analysis approach for organizing information around alternative approaches to setting NTG values.

Navigant took the following steps to conduct the Decision Analysis:

1. Define the benefits of accurate (and costs of inaccurate) NTG values in a general context.
2. Narrow the focus the analysis on one of the benefits/cost for which Navigant had access to data; specifically, the incentives paid to utilities based on the estimated net savings (m^3) achieved.
3. Establish a baseline against which a sensitivity analysis can be conducted where a selected NTG value is assumed to be correct, but in fact is incorrect by some margin of error. [24]
4. Conduct a "value of information" analysis by examining the change in incentive payments resulting from better information on NTG values compared to the cost of obtaining the information (e.g., through NTG research).

This section concludes by organizing the results of the Decision Analysis to provide insight into the tradeoffs from using different approaches to setting an NTG value.

6.1 Decision Analysis

The first step in conducting the Decision Analysis is to identify the benefits resulting from more precise NTG values. Three of the primary benefits are described.

- **Program Design and Implementation.** NTG research can be leveraged to improve program design and implementation, ultimately providing greater gross and net savings. For example, FR research can inform decisions to discontinue incenting certain measures and boost the incentives for others. More generally, NTG research will identify what influences the customers' decisions regarding investments in energy efficiency, existing customer knowledge of energy efficiency and equipment operations, and identify aspects of the program that have the greatest influence on the customer's decision to participate in the program. NTG research can also provide insights into how the program is motivating distributors, contractors and other trade allies, and how their

[24] These first three steps are part of a "loss function" analysis which identifies the costs of selecting one NTG value when another value is the actual value. While a traditional loss function analysis focuses on deviations in both the mean value and the precision of the value, for simplicity, this analysis focuses only on precision or range of the values. Navigant did not conduct a more complex analysis because this simple approach provided insight into the value of more precise NTG values, i.e., a reduction in the range of NTG values.

actions might be leading to program spillover. All of this information helps in the design of improved programs.

- **Utility Incentive Payments.** Utilities, and utility shareholders, receive incentive payments for achieving performance goals. NTG values influence the incentive payments that are paid, or not paid, to utilities. More precise estimates of NTG values mitigate the risk that utilities face of receiving incentive payments that are too small, as well as the risk that ratepayers face of making incentive payments that are too large.[25]

- **Energy Savings as a Resource.** Regardless of the NTG value, the gross savings that result from the program are unchanged. (1) From a resource planning perspective, the net effects of the energy efficiency program must be known (i.e., the impacts attributable to the program must not have occurred in the absence of the program). (2) An accurate NTG estimate is important for understanding the equity implications of a program. I.e., participants that receive payments for taking actions that they would have taken even if the program had not existed transfers wealth from ratepayers to the participant. There are policy actions that can be taken to reduce equity issues, such as expanding the program to ensure all ratepayers have access to the program. However, a first step to considering the equity implications of a program is to accurately estimate the level of FR and spillover.

In the Decision Analysis that follows, Navigant focuses on the one benefit/cost for which data was available and for which there is little debate about how to formulate the benefit/cost: utility incentive payments. Union and Enbridge conducted an analysis of the sensitivity of utility incentive payments to changes in the NTG value of custom C&I programs.[26] The sensitivity analysis data was provided by the utilities and was not verified by Navigant.

6.1.1 Union

This section presents an assessment of the value of improved information on NTG values for Union Gas. Table 6 summarizes the impact on utility incentive payments if the custom NTG value is 10 percentage points higher or lower than the current custom NTG value of 0.46 used by Union.[27]

[25] While this report highlights the impact of improved precision of NTG values on the incentive payments received by the utilities, one can easily interpret the impact on ratepayers as it is a zero-sum game (i.e., the gain in incentive payments by utilities is a cost to ratepayers and vice versa).
[26] All other data inputs in the incentive payment calculations were held constant.
[27] This analysis assumes Union meets the targeted level of net savings.

Table 6. Value of Information Assessment for Union

	NTG Value for Custom Programs		Incentives	Change in Incentives
Base Case:	**Current NTG** NTG = 0.46	→	Incentives = $2.73 M	
Scenario 1:	**Higher True NTG** NTG = 0.56	→	Incentives = $5.63 M	**(+$2.90 M)**
Scenario 2:	**Lower True NTG** NTG = 0.36	→	Incentives = $0.8 M	**(-$1.93 M)**

Source: Sensitivity Analysis provided by Union.

At the net savings target under current assumptions, if the true custom program NTG value is 10 percentage points higher (Scenario 1) Union should receive an additional $2.9 million in incentive payments for savings achieved. If, instead, the true NTG value is 10 percentage points lower (Scenario 2), Union is receiving $1.93 million in incentives for savings that are not achieved.

A swing of +/- 10 percentage points (i.e., error bounds of +/- 22%) in the custom NTG value causes a swing in incentive payments by almost $3 million on the high side and $2 million on the low side. Assuming a revised custom program NTG value (e.g., by conducting NTG research) would reduce this margin of error by one-half, the error bounds would reduce to +/- 5 percentage points (i.e., +/- 11%) in the NTG value. The swing in incentive payments at the new error bounds would be approximately $1.5 million on the high side and $1 million on the low side. If the cost of revising the NTG values are less than $1 million given these assumed error bounds; then, revising the NTG values *could be judged to be warranted*.

6.1.2 Enbridge

This section presents an assessment of the value of improved information on NTG values for Enbridge. Table 7 summarizes the impact on utility incentive payments if the custom program NTG values are 10 percentage points higher or lower than the current custom NTG values used by Enbridge.[28]

[28] This analysis assumes Enbridge meets the targeted level of net savings.

Table 7. Value of Information Assessment for Enbridge

	NTG Value for Custom Programs		Incentives	Change in Incentives
Base Case:	**Current NTG by Program** Commercial = 0.80 Commercial New Construction = 0.74 Industrial = 0.50	→	Incentives = $2.58 M	
Scenario 1:	**Higher True NTG** Commercial = 0.90 Commercial New Construction = 0.84 Industrial = 0.60	→	Incentives = $4.26 M	**(+$1.68 M)**
Scenario 2:	**Lower True NTG** Commercial = 0.70 Commercial New Construction = 0.64 Industrial = 0.40	→	Incentives = $1.45 M	**(-$1.13 M)**

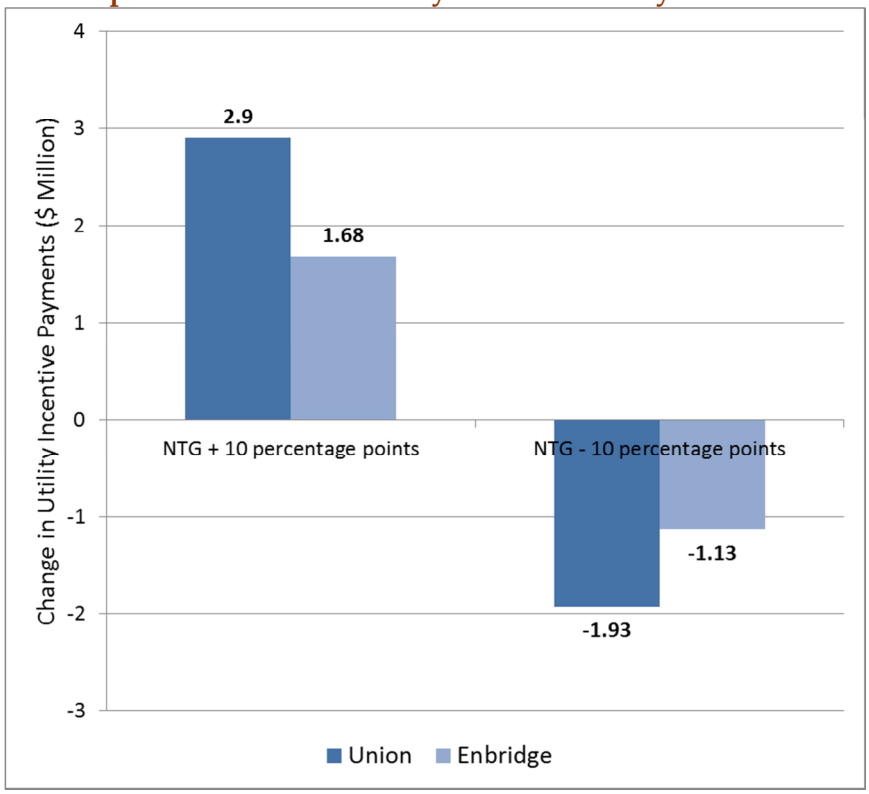
Source: Sensitivity Analysis provided by Enbridge.

At the net savings target under current assumptions, if the true custom program NTG values are 10 percentage points higher (Scenario 1) Enbridge should receive an additional $1.68 million in incentive payments for savings achieved. If, instead, the true custom program NTG values are 10 percentage points lower (Scenario 2), Enbridge is receiving $1.13 million in incentives for savings that are not achieved.

A swing of +/- 10 percentage points in custom program NTG values (i.e., error bounds of +/- 12.5% for commercial, +/- 13.5% for commercial new construction, and +/- 20% for industrial)) causes a swing in incentive payments by almost $2 million on the high side and $1 million on the low side. Assuming revised NTG values (e.g., by conducting NTG research) would reduce this uncertainty by one-half, the error bounds on the NTG values would reduce to +/- 5 percentage points in the NTG values. The swing in incentive payments at the new error bounds would be approximately $1 million on the high side and $0.5 million on the low side. If the cost of revising the NTG values are less than $0.5 million given these assumed error bounds; then, revising the NTG values *could be judged to be warranted*.

Figure 15 illustrates that the sensitivity in incentive payments to changes in custom program NTG values is greater for Union relative to Enbridge. This can be attributed to the fact that custom programs represent a larger share of Union's portfolio of programs, and consequently incentive payments, relative to Enbridge. Nevertheless, for both utilities changes in NTG values have a considerable impact on incentive payments.

Figure 15. Comparison of the Sensitivity of Incentive Payments to NTG Values



Source: Sensitivity analyses provided by Union and Enbridge.

6.2 *General Approaches to NTG*

In this section Navigant describes five general approaches to NTG representing the range of options for addressing net savings, from deeming a NTG value to conducting research to estimate a NTG value. The estimated increased precision of NTG values for each approach is identified as well as the approximate cost of the approach.

Option 1. Transfer NTG Values from Other Research

This approach transfers NTG values from the jurisdictional review. While the jurisdictional review revealed a wide range of NTG values, there is some clustering of values which could be used to inform a deemed value. If this approach is selected, the TEC sub-committee could select a NTG value from this clustering and apply it uniformly to Union and Enbridge's non-residential custom gas programs.

Advantages: The advantage of this approach is that it is simple, straightforward, uniform, and inexpensive.

Disadvantages: The disadvantage of this approach is that it does not recognize differences in the performance of different programs, designs, implementation, or program environments (such as economic conditions, energy prices, technology, and attitudes

about climate change); consequently, the transferred values may provide inaccurate estimates of net savings.

Option 2. Adjusted or Scaled NTG Values based on Program Factors

This approach uses a simple scaled or adjusted NTG value from the jurisdictional review to better represent Union and Enbridge programs. A principal objective of the detailed review of researched NTG values was to summarize NTG values based on program factors comparable to Union and Enbridge programs. In particular, Navigant characterized researched NTG values by utility-type, program-type, targeted sector, program maturity, program marketing, and region. If this approach is selected, the TEC sub-committee could select a NTG value accounting for comparable program factors and adjusting appropriately for Union and Enbridge's non-residential custom gas programs. For example, a NTG value that includes spillover should be adjusted to reflect the fact that the majority of studies that consider spillover were conducted in recent years.

Advantages: The advantage of this approach is that it is straightforward, uniform, and inexpensive. In addition, it recognizes differences in the performance of different program factors. Despite the disadvantages outlined below, the additional cost of adjusting or scaling the NTG value is so low that Option 2 is preferred in a pairwise comparison with Option 1.

Disadvantages: The disadvantage of this approach is that due to the small number of researched NTG values with comparable program factors, the credibility of the scaled or adjusted NTG values may come into question, particularly if considering spillover.

Option 3. Align NTG Values using Limited Primary Data Collection

This approach augments comparative NTG values with a small set of selected primary data gathered during the course of program implementation and/or evaluation to enhance the precision of the NTG values. The detailed review revealed that in situations where program design remains consistent, NTG values can vary substantively from one program year to the next, likely due to changes in program implementation or program environment. Interviews with participating and non-participating trade allies, for example, can provide insight into FR and spillover, informing NTG values and requiring relatively limited data collection. If this approach is selected, the TEC sub-committee could select a comparable NTG value using limited primary data collection to adjust NTG values for Union and Enbridge's programs.

Advantages: The advantage of this approach is that it recognizes differences in the performance of different programs, designs, implementation, and program environments while leveraging findings from the detailed review. NTG values will more accurately reflect actual net savings of the program.

Disadvantages: One disadvantage may be the difficulty of developing the appropriate data to collect that represents actual changes in the NTG values. Another disadvantage

of this approach is that data collection, even if limited, can be costly; however, if it is incorporated within a program process, e.g., a short survey with the payment of incentives, the costs may be limited.

Option 4. Full NTG Research Study (After Program Year)

This approach conducts full-scale evaluations specific to Union and Enbridge programs at the end of the program-year cycle. There various methods for estimating net savings, including, for example, survey-based methods and econometric modeling. The enhanced self-report approach would likely be the most appropriate approach given Union and Enbridge's programs are custom C&I and that identifying the magnitude of individual NTG components is desired.

Advantages: The advantage of this approach is that it recognizes differences in the performance of different programs, designs, implementation, and program environments. Given a full-scale evaluation, NTG values will more accurately reflect actual net savings of the program relative to the limited data collection approach.

Disadvantages: The disadvantage of this approach is that full-scale evaluations are costly. In addition, if not designed properly, NTG research estimates may be biased. Appropriate NTG research contends with a variety of potential biases including, for example, non-response bias, recall bias, reaching the appropriate person, as well as biases related to respondents providing socially desirable responses or legitimizing past behavior.

Option 5. Integrated/Fast Feedback NTG Estimation

This approach relies on Integrated Data Collection, or rolling data collection processes, to estimate NTG values specific to Union and Enbridge programs using fast-feedback. Fast-feedback approaches reduce bias associated with NTG estimates, such as recall bias, by surveying participants closer to when the decision-making actually occurs (Energy Trust of Oregon 2012). Collecting data frequently over time assures that less biased estimates of FR are calculated.

Advantages: The advantage of this approach is that it recognizes differences in the performance of different programs, designs, implementation, and program environments. Integrated or Fast Feedback NTG estimation has received a lot of attention due to its ability to help address several key estimation issues – it is easier to target the appropriate people and recall bias is reduced by reducing the time cycle between project completion and data collection.[29] Another possible advantage of this approach is that program implementation staff can see what the NTG is as the program

[29] A number of recent studies estimating NTG make sure that they at least reach appropriate participating customers within 90 days after participating, and conduct surveys on a quarterly cycle. E.g., Summit Blue Consulting, LLC., Skumatz Economic Research Associates, Inc., and Quantec, LLC. 2005. *Commercial/Industrial Performance Program (CIPP) – Market Characterization, Market Assessment and Causality Evaluation.* NYSERDA, March 2005.

is implemented through the year. As a result, there are unlikely to be surprises in the NTG value at the end of a program year. Finally, this approach can actually be less costly than the traditional full research study presented above as Option 4 if data collection leverages existing program implementation efforts. For example, NTG surveys could be linked to the incentive payment process, e.g., one to two weeks after the incentives are paid a short free rider survey could be conducted (usually by phone). This approach is similar to Option 3 with more extensive data collection.

Disadvantages: The primary disadvantage of this approach are issues that may make integration difficult, e.g., appropriate timing of data collection, appropriate survey instruments, appropriate personnel leading the data collection all done along a timeline that is based on the implementation process. In addition, conducting research closer to program participation limits the amount of spillover that can be attributed to the program.

Table 8 provides a summary of the ability of the various approaches to improve the precision of the NTG value and provides an approximate cost of each NTG approach. Though an approximation, Navigant believe a 50% improvement in the precision of custom NTG values at a cost of $0.25 – 0.5 million is a reasonable estimate.[30]

Table 8. Ability of NTG Approaches to Produce More Precise NTG Values

General NTG Approach	Estimated Improved Precision (or Reduced Range) of NTG Value	Cost of NTG Approach per Utility (approximate)
Transfer NTG Values from Other Research	Little change	$3 – 5k
Adjust NTG Values based on Program Factors	Little change	$5 – 10k
Align NTG Values using Limited Primary Data	3 percentage points	$100 – 200k
Full NTG Research Study – After Program Year	5 percentage points	$250 – 500k
Integrated/Fast Feedback NTG Estimation	5 percentage points	$250 – 500k

Source: Navigant analysis.

[30] The cost estimates only reflect the contractor's program evaluation costs and do not include costs incurred by the utility and the TEC. These estimates assume primary data collection on program participants, a set of trade allies, and a sample of non-participants. Actual costs may vary depending on sub-strata and/or sector differentiation (e.g., commercial, commercial new construction, industrial).

7. Summary

The net savings of Union and Enbridge's custom C&I programs were first evaluated by Navigant (formerly Summit Blue Consulting) in 2007-2008. Following the study, the OEB approved the FR adjustment, but did not approve a spillover value. Since that time, there have been a host of program environment changes, including economic conditions, energy prices, advances in technology, as well as changes in the design and delivery of the custom programs. As a result, a key priority for Ontario's TEC sub-committee is to update the FR adjustment factor and reconsider the spillover adjustment.

As an initial step, the TEC sub-committee contracted Navigant to provide information to assist the TEC sub-committee in their deliberations on the appropriate approach to NTG for natural gas DSM programs in Ontario. Through a jurisdictional review of the approach to net savings, and a review of researched NTG values for programs comparable to Union and Enbridge's custom C&I gas programs, Navigant provides an assessment of the various approaches to NTG. Following is a summary of key findings:

Approach to Net Savings

- The majority of jurisdictions with ratepayer funded energy efficiency programs conduct NTG research, though only half adjust gross savings based on research.
- U.S. states that provide a performance incentive mechanism for utilities or program administrators are more likely to make deemed or researched NTG adjustments.
- There appears to be a trend towards considering participant and NPSO in NTG research in recent years.

Researched NTG Values in Selected Jurisdictions

- Navigant identified a total of 19 documents that conducted NTG research of non-residential gas programs that calculated 38 distinct results.
- Researched net-of-free ridership values for non-residential gas programs exhibit a wide dispersion (21% to 100%) with a slight "clustering" of values between 40% and 90%.
- Trends in researched NTG values that consider spillover, as well as trends when considering specific program characteristics, should be interpreted with caution due to the small sample sizes.
- Union and Enbridge's current NTG values are within the range of researched values. Union's NTG value is below the average value. Enbridge's NTG value for the commercial sector is above the average value while the NTG value for the industrial sector is below the average value.

Assessing Options for NTG

- There are a variety of benefits of accurate (costs of inaccurate) NTG values that could be considered; utility incentive payments are just one.
- Improving the precision of NTG values has a sizable impact on incentive payments.
- NTG values with a margin of error of +/- 10 percentage points have roughly a $1 - $3 million impact on utility incentive payments.
- Alternate NTG approaches could improve the precision of NTG values by approximately 50% at an approximate cost of $0.25 - $0.50 million per utility.

The objective of this report is to provide information to assist the TEC sub-committee in their determination on the appropriate approach to NTG for DSM programs in Ontario, and not to provide a specific recommendation. While this report is not comprehensive in addressing all potential considerations, such as other benefits of accurate (costs of inaccurate) NTG values, it provides important information relevant to the discussion. In addition to summarizing the regulatory and methodological approach taken by other jurisdictions, and summarizing NTG values for programs with characteristics similar to Union and Enbridge's custom C&I programs, Navigant provides insight into the risks associated with inaccurate NTG values and the approximate cost of mitigating those risks.

Appendix A. General and Methodological References

Kushler, Martin, Nowak, Seth, and Patti White. 2012. *A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs.* American Council for an Energy-Efficient Economy. Available from: http://www.aceee.org/sites/default/files/publications/researchreports/u122.pdf.

MEEA. *Energy Efficiency Policies and Practices in Midwestern States.* Accessed January 23, 2013: http://mwalliance.org/policy/energy-efficiency-policies-and-practices-midwestern-states.

Messenger, Mike et al. 2010. *Review of Evaluation, Measurement and Verification Approaches Used to Estimate the Load Impacts and Effectiveness of Energy Efficiency Programs.* Lawrence Berkeley National Lab, April 2010. Available from: http://eetd.lbl.gov/ea/emp/reports/lbnl-3277e.pdf

Saxonis, W. 2007. *Free Ridership and Spillover: A Regulatory Dilemma.* Energy Program Evaluation Conference, Chicago, IL.

The Cadmus Group. 2012. *Assessment of Energy and Capacity Savings Potential in Iowa.* Iowa Utility Association, February 28, 2012.

The Cadmus Group. 2011. *Net-to-Gross: Updating Research.* Salt River Project, December 20, 2011.

Appendix B. Summary of NTG Values for Excluded Programs

There are two jurisdictions/programs that were excluded from the detailed review but provide additional information to the TEC sub-committee on NTG values in other jurisdictions.

California's **Savings by Design** program is a custom C&I program that has been offered for more than 10 years. This program was excluded from our review because the methodology used to calculate net savings was different from the approach used by the remaining documents reviewed. In particular, responses to a FR survey were used to adjust the baseline of an engineering model. The NTG ratio was then calculated as the ratio of gross to net savings, as estimated by the engineering model. This approach accounts for interactive effects between measures and resulted in NTG values greater than 100%, even though only a FR adjustment was made. The table below summarizes the NTG values for Savings by Design.

NTG Values for Savings by Design

Category	NTG Value
Combined	87%
PG&E	66%
SDG&E	109%
SCE	101%
SCG	25%

Source: RLW Analytics. 2008. *An Evaluation of the 2004-2005 Savings by Design Program.* California Public Utilities Commission, October 2008.

NYSERDA has implemented a number of C&I programs with custom components, and include both electric and gas measures. Relevant programs include: **Industrial and Process Efficiency, Flexible Technical Assistance, C&I Performance, and New Construction Program.** Recent research estimates NTG values using a rigorous methodology, but were excluded from our review because the values were not reported separately for electric and gas measures. The Table below summarizes NTG values for these programs, where NTG = 1 – Free Ridership + Participant Spillover + Non-Participant Spillover.

NTG Values for NYSERDA Programs

Program	NTG Value
Industrial and Process Efficiency	104%
Flexible Technical Assistance	117%
New Construction Program	116%
C&I Performance	123%

Sources: Megdal & Associates. 2012. *NYSERDA 2009-2010 Industrial and Process Efficiency Program Impact Evaluation Report; Impact Evaluation: NYSERDA 2007-2009 FlexTech Program*; *New Construction Program (NCP) Impact Evaluation Report for Program Years 2007-2008;*
Summit Blue Consulting. 2007. *Commercial and Industrial Performance Program (CIPP): Market Characterization, Market Assessment and Causality Evaluation.* NYSERDA, May 2007.

Appendix C. Annotated Bibliography of Documents Reviewed

2004/2005 Statewide Express Efficiency and Upstream HVAC Program Impact Evaluation	
Author and Date	Itron and KEMA. December 31, 2008.
Jurisdiction	California
Utilities	Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison, and Southern California Gas Company
Program Name	Express Efficiency Program
Program Summary	The Express Efficiency program targets small and medium-sized commercial customers (electricity demand less than 500 kW; annual gas consumption less than 250,000 therms) providing financial incentives to end-users for the installation of selected energy efficient electric and gas technologies (e.g., lighting, refrigeration, air conditioning, food service, agricultural, and gas technologies). The program implements a marketing strategy directly with the end-user and through upstream partners (e.g., vendors).
Program Year	2004-2005
NTG	0.51
Free-Ridership	NTG=1-FR; 0.49
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Self-report. Participant surveys were completed by end-users. The free-ridership score was the average of scores from two methodologies using participant survey data. One methodology adjusts for timing.

Note that this evaluation study also addresses the Upstream HVAC/Motors; however, no gas savings were reported under this program in 2004-2005.

2004-2005 Statewide Nonresidential Standard Performance Contract Program Measurement and Evaluation Study	
Author and Date	Itron. September 30, 2008.
Jurisdiction	California
Utilities	Pacific Gas & Electric, San Diego Gas & Electric, and Southern California Edison
Program Name	Nonresidential Standard Performance Contract Program
Program Summary	This program provides financial incentives for custom cost effective energy saving retrofits of existing facilities. While targeted at large and medium-sized businesses, small businesses can participate if they are ineligible for incentives through California's Express Efficiency program. Major measure types include: lighting and lighting controls, variable speed-drive for motors, HVAC, and industrial processes. Pacific Gas & Electric and San Diego Gas & Electric offer incentives for energy efficiency gas measures, with incentives of $1.00 per therm.
Program Year	2004-2005
NTG	0.57
Free-Ridership	0.43
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Self-report. Participant surveys were completed by end-users. The sample used for gross impact analysis was also used for net impact analysis. The free-ridership score was the average of scores from two methodologies using participant survey data, in which one methodology adjusted for timing.

2006-2008 Retro-Commissioning Impact Evaluation	
Author and Date	SBW Consulting. February 8, 2010.
Jurisdiction	California
Utilities	Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison, and Southern California Gas
Program Name	More than two dozen Retro-Commissioning programs.
Program Summary	This report presents evaluation, measurement and verification activities for over two dozen commercial retro-commissioning programs that target high impact measures (i.e. contribute more than 1% of utilities' savings portfolio). Given the number of programs, program design varies and may include technical assistance and/or financial incentives.
Program Year	2006-2008
NTG	PG&E: 0.86 SCE: 0.91 SCG: 0.92 SDG&E: 0.68
Free-Ridership	PG&E: 0.14 SCE: 0.09 SCG: 0.08 SDG&E: 0.32
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Enhanced self-report. Includes participant surveys, vendor surveys, program staff interviews, and file reviews. In some cases supplemental questions were asked of participant decision-makers. Free-ridership estimate is based on survey questions about timing and selection, program influence, and likelihood. Timing adjustments are included. When multiple elements feed into one score, the maximum (representing highest program influence) is used.

2006-2008 Evaluation Report for PG&E Fabrication, Process and Manufacturing Contract Group	
Author and Date	Itron. February 3, 2010.
Jurisdiction	California
Utilities	Pacific Gas & Electric
Program Name	Program administered by PG&E: • Fabrication, Process and Manufacturing Programs administered by a third-party: • Heavy Industry Energy Efficiency Program • California Wastewater Process Optimization Program • Energy Efficiency Services for Oil Production • Wastewater Process Efficiency Initiative • Refinery Energy Efficiency Program • Assessment, Implementation and Monitoring • Value and Energy Stream Mapping Advantage Plus • Energy Efficiency of Compressed Systems • C&I Boiler Efficiency Program
Program Summary	The Pacific Gas & Electric Fabrication, Process and Manufacturing contract group is comprised of one PG&E program and nine third-party programs. These programs provide technical assistance and financial incentives for the installation of custom and prescriptive electric and gas measures in industrial facilities. Eligible sectors include industrial and manufacturing, water supply and treatment, wastewater, oil and gas extraction, refining, and production. Major measure types include: boiler upgrades and controls, boiler heat recovery, pipe and duct insulation, HVAC, process improvements, as well as various electric measures.
Program Year	2006-2008
NTG	0.31
Free-Ridership	0.69
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Enhanced self-report. Includes participant surveys, vendor surveys, program staff interviews, and file reviews. In some cases supplemental questions were asked of participant decision-makers. Free-ridership estimate is based on survey questions about timing and selection, program influence, and likelihood. Timing adjustments are included. When multiple elements feed into one score, the maximum (representing highest program influence) is used.

Evaluation of the Southern California Gas Company 2004-2005 Non-Residential Financial Incentives Program	
Author and Date	ECONorthwest. June 6, 2006.
Jurisdiction	California
Utilities	Southern California Gas Company
Program Name	Nonresidential Financial Incentives Program
Program Summary	This program provides technical assistance, education, and financial incentives for prescriptive and custom energy efficiency gas measures. This program is targeted at small and medium-sized customers, spanning the commercial, industrial and agricultural sectors. There are three program offerings: • The Commercial Food Service Equipment Rebate program offering provides financial incentives for prescriptive measures. Examples include ovens, broilers, griddles, and fryers. • The Nonresidential Equipment Replacement program offering provides financial incentives for the replacement of existing gas technologies with energy efficient alternative. Examples include industrial furnaces, ovens, dryers, washers, and more. • The Nonresidential Energy Conservation program offering provides financial incentives for energy efficiency retrofits and energy efficiency improvements to industrial processes. Examples include heat-recovery, process steam improvements, and high-efficiency burner replacements.
Program Year	2004-2005
NTG	0.70
Free-Ridership	0.30
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Self-report. Participant surveys were completed by end-users. Three methodologies were implemented though a preferred methodology is identified. This methodology calculates a probability of influence based on the influence of the financial incentive, program representatives, and adjusts for timing.

Comprehensive Process and Impact Evaluation of the Business Heating Efficiency Program - Colorado	
Author and Date	TetraTech. December 14, 2011.
Jurisdiction	Colorado
Utilities	Xcel Energy
Program Name	Business Heating Efficiency Program
Program Summary	This program provides financial incentives to commercial customers for prescriptive energy efficient gas measures. Major measure types include: new high efficiency hot water boilers and furnaces, improvements to existing boilers and hot water heaters, or boiler tune-ups to maintain peak operating efficiency.
Program Year	2011
NTG	0.85
Free-Ridership	0.26
Participant Spillover	0.11 (Like)
Non-Participant Spillover	N/A – Conducted interviews with HVAC trade allies but were unable to quantify NPSO.
Research Method	Self-report. Surveys include questions about the timing and selection of program measures, the influence of the program (whether rebate, recommendation, or other program intervention), and the likelihood of various actions now and in the future had the program not been available. Methodology adjusts free-ridership score if past program participation in any Xcel Energy program influences the decision to install a measure. Spillover is considered if it occurs within 4 years.

2011 C&I Natural Gas Programs Free-Ridership and Spillover Study	
Author and Date	TetraTech. June 26, 2012.
Jurisdiction	Massachusetts
Utilities	National Grid, NSTAR, Unitil, Berkshire Gas, Columbia Gas, and New England Gas
Program Names	All C&I custom and prescriptive gas programs were included in this evaluation. • National Grid programs include: New Construction (custom and prescriptive), Retrofit (custom and prescriptive), Direct Install (prescriptive) • NSTAR programs include: Business Solutions (custom), Construction Solutions (custom), Small Business Solutions (custom and prescriptive) • Columbia Gas programs include: Large Custom, Small Custom, Prescriptive • Unitil programs include: Large Retrofit (custom and prescriptive), Gas Networks (prescriptive), Small Direct Install (prescriptive) • New England Gas programs include: Retrofit (custom), Lost Opportunity (prescriptive), Direct Install (prescriptive) • Berkshire Gas programs include: Custom, Prescriptive
Program Summary	These programs provide financial incentives for installing custom and prescriptive energy efficient gas measures.
Program Year	2011
NTG	0.79
Free-Ridership	0.305
Participant Spillover	0.085 (Like)
Non-Participant Spillover	0.007
Research Method	Enhanced self-report. Combination of participant (decision-makers) and trade ally surveys. Surveys include questions about likelihood of equivalent efficiency and quantity of program measures, as well as the timing. Questions were also included about the influence of program and various features of the program, as well as the influence of participating in past programs. Free-ridership and spillover estimates are weighted by therm savings and the probability of being surveyed. Surveys with design professionals and equipment vendors were used to calculate free-ridership in cases where the decision was heavily influenced by the design professional/equipment vendor, as well as to calculate NPSO.

Achieving Natural Gas Savings Goals: Commercial Heating Programs Heat It Up	
Author and Date	TetraTech and Xcel Energy. 2012 ACEEE Summer Study on Energy Efficiency in Buildings.
Jurisdiction	Minnesota
Utilities	Xcel Energy
Program Name	Business Heating Efficiency Program
Program Summary	This program provides financial incentives to commercial customers for prescriptive energy efficient gas measures. Major measure types include: new high efficiency hot water boilers and furnaces, improvements to existing boilers and hot water heaters, or boiler tune-ups to maintain peak operating efficiency.
Program Year	2011
NTG	1.09
Free-Ridership	0.17
Participant Spillover	0.26 (Like)
Non-Participant Spillover	N/A – Conducted interviews with HVAC trade allies but were unable to quantify NPSO.
Research Method	Self-report. Surveys include questions about the timing and selection of program measures, the influence of the program (whether rebate, recommendation, or other program intervention), and the likelihood of various actions now and in the future had the program not been available. Methodology adjusts free-ridership score if past program participation in any Xcel Energy program influences the decision to install a measure. Spillover is considered if it occurs within 4 years.

Note: Research method is the method employed by TetraTech in the evaluation of Colorado's Xcel Energy Business Heating Efficiency Program which is the same method employed in Minnesota. This paper relies on TetraTech's evaluation to report NTG values, though the report itself is not publicly available.

New Jersey's Clean Energy Program Energy Impact Evaluation: SmartStart Program Impact Evaluation	
Author and Date	KEMA. September 17, 2009.
Jurisdiction	New Jersey
Utilities	New Jersey's Clean Energy Program
Program Name	SmartStart Buildings Program (New Construction, Schools, and Retrofit program)
Program Summary	This program provides financial incentives and technical assistance for energy efficient measures in new construction, retrofits of existing buildings, and schools.
Program Year	2006
NTG	0.21
Free-Ridership	0.79
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Self-report. Surveys include questions about likelihood of equivalent efficiency and quantity of program measures, as well as the timing. Free-ridership measures for timing, efficiency, and quantity are multiplied to determine free-ridership. Adjustments to free-ridership score based on timing is made. The sample size for Schools and New Construction programs is small.

Evaluation of 2011 DSM Portfolio	
Author and Date	ADM Associates. June 29, 2012.
Jurisdiction	New Mexico
Utilities	New Mexico Gas Company
Program Names	Commercial Solutions, Commercial High Efficiency Water Heater, Commercial Energy Star Food Service, and SCORE Pilot
Program Summary	These programs provide financial incentives for custom and prescriptive measures installed by commercial customers. • The Commercial Solutions program includes two program offerings: direct install of low flow faucet aerators and pre-rinse spray valves, and custom incentives of up to $0.75 per therm for custom measures, such as: water heating, HVAC, building envelope, and industrial processes. The SCORE Pilot is similar to the Commercial Solutions program but is targeted at K-12 school districts. • The Commercial Energy Star Food Services program provides prescriptive rebates for commercial kitchen measures, such as fryers, dishwashers, convection ovens, and commercial griddles. • The Commercial High Efficiency Water Heater program provides financial incentives for storage tank and tankless water heaters.
Program Year	2011
NTG	Commercial Solutions: 0.96 Commercial High Efficiency Water Heater: 1.00 Commercial Energy Star Food Service: 1.00 SCORE Pilot: 1.00
Free-Ridership	Commercial Solutions: 0.04
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Self-report. Surveys include questions about the financial ability to purchase measures without the program, the importance of the financial incentive, prior planning to purchase measures, and demonstrated behavior in purchasing similar measures without a financial incentive.

Fast Feedback Results	
Author and Date	Energy Trust of Oregon. April 25, 2012.
Jurisdiction	Oregon
Utilities	Energy Trust of Oregon
Program Names	Existing Buildings Program, Production Efficiency Program
Program Summary	Descriptions of programs not included in study. Information that follows is from the Energy Trust of Oregon's website (http://energytrust.org) Existing Buildings program provides custom and prescriptive financial incentives to existing commercial facilities. Major gas measure types include: HVAC, furnace, radiant heater, hot water tanks, tankless water heaters, boilers, and steam traps. Production Efficiency program provides technical assistance and financial incentives for energy efficiency improvements for industrial processes, including manufacturing, agriculture, and water/wastewater treatment. Major measure types include: motors, compressed air, variable speed drives, refrigeration, pumps, fans, and lighting.
Program Year	Q2 2010
NTG	Existing Buildings: 0.73 Existing Multifamily: 0.52 Production Efficiency: 0.80
Free-Ridership	Existing Buildings: 0.27 Existing Multifamily: 0.48 Production Efficiency: 0.20
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Self-report. Surveys are conducted with participants that received a financial incentive within the previous month. The survey is designed to be completed in no more than 5 minutes and consists of 10 questions or less. Free-ridership is calculated as the sum of a project change score and an influence score. The project change score is based on survey questions about the actions the customer would have taken if the program was not available. Influence questions ask about the influence of the program, trade ally influence, etc.

Impact and Process Evaluation of the 2006-2007 Building Efficiency Program	
Author and Date	Research Into Action and the Cadmus Group. August 3, 2009.
Jurisdiction	Oregon
Utilities	Energy Trust of Oregon
Program Name	Building Efficiency Program
Program Summary	This program provides technical assistance and financial incentives for electric and gas energy-saving measures installed by commercial and institutional customers. Financial incentives are provided for both prescriptive and custom measures. Major measure types include: lighting, motors, HVAC, gas space and water heaters, restaurant equipment, and insulation.
Program Year	2006-2007
NTG	0.70
Free-Ridership	0.30
Participant Spillover	Qualitative assessment.
Non-Participant Spillover	N/A
Research Method	Self-report. Survey questions consider program influence, intentions for the project without the program, and budget.

Evaluation of Building Efficiency Program 2004 &2005	
Author and Date	ADM Associates. February 2009.
Jurisdiction	Oregon
Utilities	Energy Trust of Oregon
Program Name	Building Efficiency Program
Program Summary	This program provides technical assistance and financial incentives for electric and gas energy-saving measures installed in existing commercial, institutional, and agricultural facilities. Financial incentives are provided for both prescriptive and custom measures. Major measure types include: lighting, motors, HVAC, gas space and water heaters, restaurant equipment, and insulation.
Program Year	2004-2005
NTG	2004: 0.65 2005: 0.95
Free-Ridership	2004: 0.35 2005: 0.05
Participant Spillover	Qualitative assessment.
Non-Participant Spillover	N/A
Research Method	Self-report. Survey questions consider program influence, intentions for the project without the program/prior planning, and previous experience with the measure. Each question is binary (i.e. yes/no). Partial free-ridership is explored through questions about efficiency level, quantity and timing.

Impact and Process Evaluation of the 2006-2007 New Building Efficiency Program	
Author and Date	ADM Associates. June 2009.
Jurisdiction	Oregon
Utilities	Energy Trust of Oregon
Program Name	New Building Efficiency Program
Program Summary	This program provides technical assistance and financial incentives for electric and gas energy-saving measures installed in new commercial facilities or commercial facilities undergoing major renovation. Major measure types include: lighting, HVAC, motors, energy management systems, and washer/dryers.
Program Year	2006-2007
NTG	0.67
Free-Ridership	0.33
Participant Spillover	Qualitative assessment.
Non-Participant Spillover	N/A
Research Method	Self-report. Participant surveys were conducted. Free-ridership estimates are based on survey questions that ask about the influence of the program, the participants' intentions for the project if the program were not available, and their financial ability to install the measures if the program were not available.

C&I Energy Efficiency Retrofit Custom Programs Portfolio Evaluation	
Author and Date	Navigant Consulting. February 3, 2012.
Jurisdiction	Washington
Utilities	Puget Sound Energy
Program Name	Custom Grant Program
Program Summary	This program provides financial incentives for the installation of custom energy efficient measures as part of a retrofit, new construction, or expansion of existing facilities project. Major measure types include: lighting, boilers, HVAC, variable speed drives, and process improvements.
Program Year	2010-2011
NTG	1.02-1.1
Free-Ridership	0.27
Participant Spillover	0.07-0.09 (inside like); 0.04-0.05 (outside like)
Non-Participant Spillover	0.18-0.23
Research Method	Self-report. Surveys of participants and non-participants were conducted. Free-ridership was estimated based on survey questions about timing, efficiency, quantity, and program importance. Spillover calculated as a factor of savings derived from spillover project based on program influence. Savings were assumed equal to savings by in-program projects (by measure-type). Similar calculations were conducted for NPSO.

Focus on Energy Evaluation: Business Programs – Additional Looks at Attribution	
Author and Date	PA Consulting Group and KEMA. February 26, 2010.
Jurisdiction	Wisconsin
Utilities	Focus on Energy
Program Name	The names of specific program offerings are not reported.
Program Summary	Various programs provide technical assistance and financial incentives for implementing cost effective energy efficiency measures. Both prescriptive and custom incentives are available. Targeted sectors include commercial, industrial, agricultural, and institutional. Major measure types include: boilers, HVAC, refrigeration, water heater, expanded processes, and lighting.
Program Year	July 1, 2007 through September 30, 2008
NTG	0.52
Free-Ridership	0.48
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Enhanced self-report. Surveys of participants and trade allies were conducted. Free-ridership survey questions ask about timing, efficiency, and the quantity of measures installed if the program were not available. These free-ridership estimates are multiplied (e.g., NTG=1-FqFeFt). Surveys include consistency checks. NTG estimates based on participant survey data is compared to estimates based on trade ally survey data. The maximum value is selected.

Focus on Energy Evaluation: Business Programs Impact Evaluation Report – Last Quarter of Calendar Year 2009 and First Two Quarters of Calendar Year 2010	
Author and Date	TetraTech and KEMA. January 27, 2011.
Jurisdiction	Wisconsin
Utilities	Focus on Energy
Program Name	The names of specific program offerings are not reported.
Program Summary	Various programs provide technical assistance and financial incentives for implementing cost effective energy efficiency measures. Both prescriptive and custom incentives are available. Targeted sectors include commercial, industrial, agricultural, and institutional. Major measure types include: boilers, HVAC, refrigeration, water heater, expanded processes, and lighting.
Program Year	October 1, 2009 through June 30, 2010
NTG	2009: 0.60 2010: 0.47
Free-Ridership	2009: 0.40 2010: 0.53
Participant Spillover	(Identified in a separate study as 0.002%)
Non-Participant Spillover	N/A
Research Method	Enhanced self-report. Surveys of participants and trade allies were conducted. Free-ridership survey questions ask about timing, efficiency, and the quantity of measures installed if the program were not available. These free-ridership estimates are multiplied (e.g., NTG=1-FqFeFt). Surveys include consistency checks. NTG estimates based on participant survey data is compared to estimates based on trade ally survey data. The maximum value is selected.

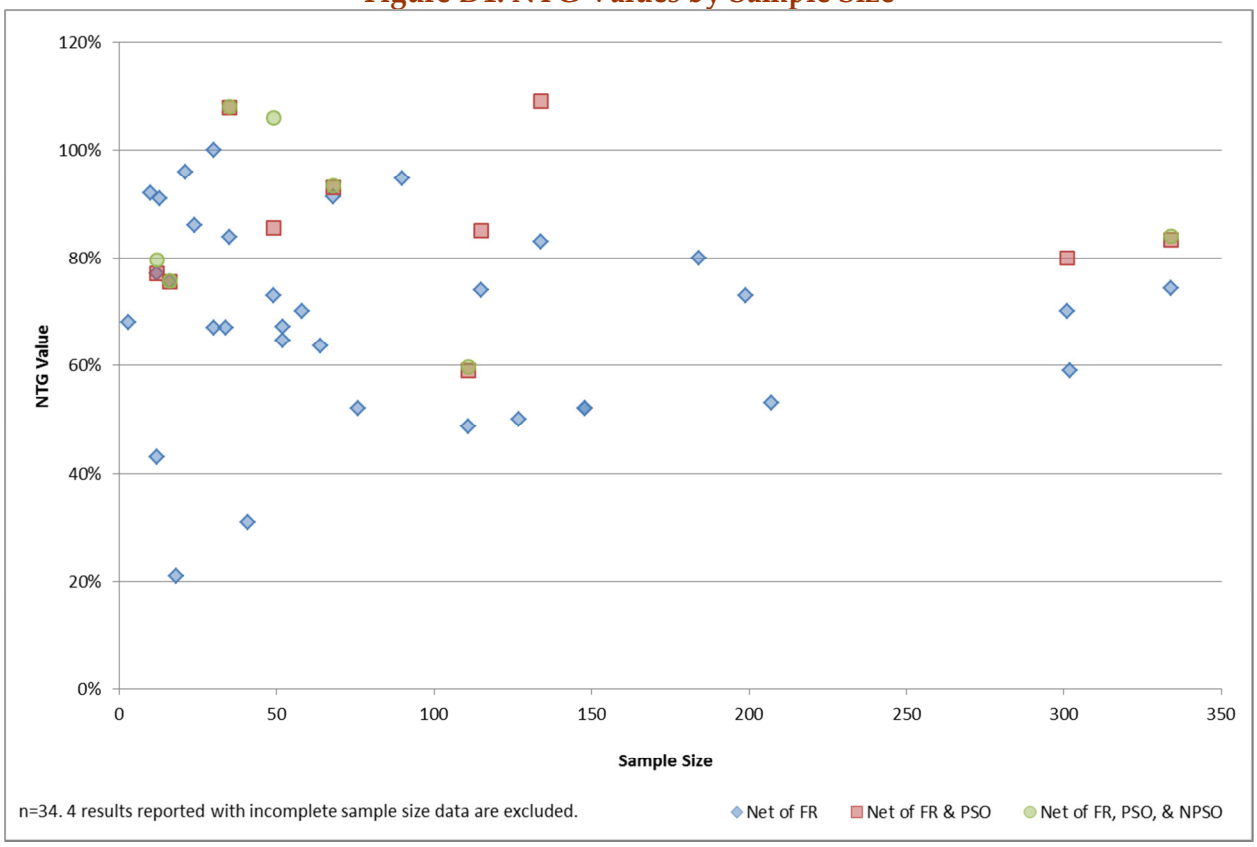
Focus on Energy Evaluation: Semiannual Report (Second Half of 2009)	
Author and Date	PA Consulting Group. April 23, 2010.
Jurisdiction	Wisconsin
Utilities	Focus on Energy
Program Name	The names of specific program offerings are not reported.
Program Summary	Various programs provide technical assistance and financial incentives for implementing cost effective energy efficiency measures. Both prescriptive and custom incentives are available. Targeted sectors include commercial, industrial, agricultural, and institutional. Major measure types include: boilers, HVAC, refrigeration, water heater, expanded processes, and lighting.
Program Year	Q3 and Q4 2009
NTG	0.59
Free-Ridership	0.41
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Enhanced self-report. Participant surveys and surveys with trade allies were conducted. Free-ridership survey questions ask about timing, efficiency, and the quantity of measures installed if the program were not available. Conducted a sensitivity analysis on treatment of timing using methodologies adopted in other jurisdictions finding little variation.

Focus on Energy Evaluation: Semiannual Report (First Half of 2009)	
Author and Date	PA Consulting Group. October 19, 2009.
Jurisdiction	Wisconsin
Utilities	Focus on Energy
Program Name	The names of specific program offerings are not reported.
Program Summary	Various programs provide technical assistance and financial incentives for implementing cost effective energy efficiency measures. Both prescriptive and custom incentives are available. Targeted sectors include commercial, industrial, agricultural, and institutional. Major measure types include: boilers, HVAC, refrigeration, water heater, expanded processes, and lighting.
Program Year	A1 and A2 2009
NTG	0.52
Free-Ridership	0.48
Participant Spillover	N/A
Non-Participant Spillover	N/A
Research Method	Enhanced self-report. Participant surveys and surveys with trade allies were conducted. Free-ridership survey questions ask about timing, efficiency, and the quantity of measures installed if the program were not available.

Appendix D. NTG Values by Sample Size

The figure below summarizes NTG values by sample size. Sample sizes are reported in raw form and do not reflect the percent of participants or percent of energy savings. Consequently, this Figure should be interpreted with caution.

Figure D1. NTG Values by Sample Size

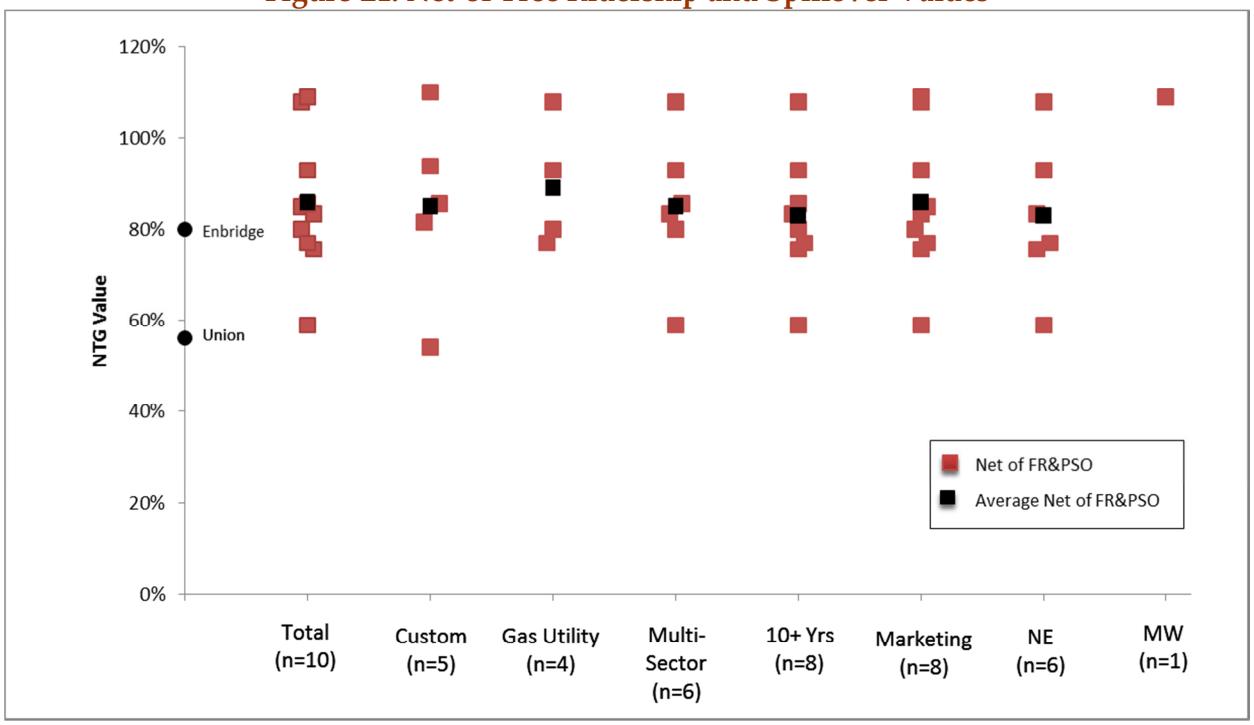


Source: Navigant analysis. Note that the sample size (n) represents the number of unique NTG results (program-utility-year combinations) reported in the 19 studies.

Appendix E. Researched Net-of-Free Ridership and Spillover Values

The figure below summarizes net-of-free ridership and PSO values that are most relevant to Union and Enbridge programs. In particular, values are presented for the following categories: custom program, gas utility, multi-sector, 10+ years since program inception, a combination of direct and channel/partner marketing strategy, and northern regions (Northeast and Midwest). Note that the values reported for Union and Enbridge are researched values representing all sectors resulting from the 2007-2008 attribution study. Caution should be used in interpreting trends due to the small sample sizes. Nevertheless similar trends emerge. Enbridge and Union NTG values are below the average values.

Figure E1. Net-of-Free Ridership and Spillover Values



Source: Navigant analysis. Note that the sample size (n) represents the number of unique NTG results (program-utility-year combinations).

Appendix D – Enbridge Gas Distribution 2012 Commercial and Industrial Custom Program Results

Summary of Enbridge Gas Distribution 2012 Gross Lifetime m3 Savings

Market Sector	Number of Custom Projects	Gross Lifetime Natural Gas Savings (m^3)	Average Gross Lifetime Natural Gas Savings (m^3)	Standard Deviation of Gross Lifetime Natural Gas Savings (m^3)
Commercial Existing	490	286,039,013	555,416	1,247,605
Large New Construction	70	181,676,611	2,523,286	6,155,388
Multi-Residential	275	275,160,544	739,679	926,207
Industrial	91	610,001,530	6,288,676	20,832,106
Grand Total	**926**	**1,352,877,698**	**10,107,057**	**7,290,327 (avg.)**

Summary of Enbridge Gas Distribution 2012 Net Lifetime m3 Savings

Market Sector	Number of Custom Projects	Net Lifetime Natural Gas Savings (m^3)	Average Lifetime Natural Gas Savings (m^3)	Standard Deviation Lifetime Natural Gas Savings (m^3)
Commercial Existing	490	251,714,332	488,766	1,097,893
Large New Construction	70	134,925,548	1,873,966	4,552,462
Multi-Residential	275	220,128,435	591,743	740,965
Industrial	91	305,915,406	3,153,767	10,413,855
Grand Total	**926**	**912,683,721**	**6,108,242**	**4,201,294 (avg.)**

Appendix E – Union Gas 2012 Commercial and Industrial Custom Program Results

Summary of Union Gas 2012 Gross Lifetime m3 Savings

Sector	Number of Projects	Gross Lifetime Natural Gas Savings (m^3)	Average Gross Lifetime Natural Gas Savings (m^3)	Standard Deviation of Gross Lifetime Natural Gas Savings (m^3)
Commercial Existing	160	160,929,048	1,005,807	3,068,522
Commercial New Construction	8	40,381,144	5,047,643	21,565,912
Small Industrial Agriculture	78	250,881,301	3,216,427	3,892,460
Small Industrial Non-Agriculture	229	1,000,892,847	4,370,711	7,755,427
Large Industrial Rate T1 and Rate 100	180	3,165,754,523		
Total	**655**	**4,618,838,863**	**n/a**	**n/a**

Summary of Union Gas 2012 Net Lifetime m3 Savings

Sector	Number of Projects	Net Lifetime Natural Gas Savings (m3)	Average Net Lifetime Natural Gas Savings (m3)	Standard Deviation Of Net Lifetime Natural Gas Savings (m3)
Commercial Existing	160	74,161,791	463,511	1,411,312
Commercial New Construction	8	18,575,326	2,321,916	9,920,320
Small Industrial Agriculture	78	115,405,399	1,479,556	1,790,531
Small Industrial Non-Agriculture	229	460,410,710	2,010,527	3,567,497
Large Industrial Rate T1 and Rate 100	180	1,456,247,081		
Total	**655**	**2,124,800,307**	**n/a**	**n/a**

MEMORANDUM

To: John DeVenz and Deborah Bullock, Enbridge
Muhammad Saleem and Leslie Kulperger, Union Gas

From: John Dikeos and Nick Ebbs, ICF

Date: October 23, 2017

Re: Hydronic Boiler System Baseline Study: Status Update

This memo provides an update regarding the Hydronic Boiler Baseline Study that ICF is carrying out on behalf of Enbridge Gas Distribution ("Enbridge") and Union Gas Limited ("Union Gas") at the direction of the Ontario Energy Board. The objective of this assignment is to collect market data on standard efficiency hydronic boilers typically sold in retrofit applications in Ontario in order to develop baseline boiler assumptions. This will allow Enbridge and Union Gas to more accurately estimate the savings that are resulting from high efficiency and condensing boiler retrofit installations. ICF's revised proposal to carry out this scope of work is dated October 14, 2016 and the project kickoff meeting occurred on February 2, 2017.

Project Resources

Bob Bach of Energy Profiles Ltd., a former HVAC contractor and a noted boiler equipment expert, was acting as a subcontractor to ICF on this project. On May 11, 2017, Mr. Bach informed ICF that he was no longer able to participate any further in this project. His role on the Boiler Baseline study was centered on providing boiler-related expertise, including:

- **Study approach:** Input to the final work plan and boiler baseline approach assessment.
- **Boiler sales data:** Assistance with boiler sales data collection through the Canadian Institute of Plumbing and Heating (CIPH).
- **Market actor consultations:** Support related to identifying market actors for the market characterization consultations.
- **Training material development:** Leading the development of training material for on-site auditors to improve their knowledge of boilers and the associated features being focused on in this study.
- **Training delivery:** Supporting the delivery of training material to on-site auditors, including assistance with identifying an appropriate site for the on-site portion of the training.
- **Reporting:** Inputs to the study reporting, including insights into the boiler market and reviews of draft deliverables.

ICF sought out additional boiler expertise in order to replace the role Mr. Bach was intended to play for the project. This included identifying and engaging boiler experts to assist with development and delivery of training material for our on-site auditors and the identification of an appropriate site for the on-site portion of the training. The following boiler experts were identified to support these activities:

- **Phillip Paterson, Partner and Operation Supervisor/Foreman, PSL Mechanical Heating and Air Conditioning Inc.:** Mr. Paterson has been working with large commercial boilers for over 10 years. Over the years, he has worked with building owners and property managers to maintain, service and upgrade their mechanical systems. Mr. Paterson assisted with the preparation of training material and carrying out the on-site training.
- **John Goshulak, Vice President Sales and Marketing, Weil-McLain Canada:** Mr. Goshulak is a professional engineer with over 25 years in the HVAC business, including a wealth of experience with hydronic boilers. He recently supported ICF with a technology assessment study, where he agreed to participate in a market actor consultation, and he was also referred to ICF to support this project by Mr. Bach. Mr. Goshulak assisted ICF in identifying an appropriate site for the on-site training and in coordinating the site visit.

Although his role has changed, Mr. Bach agreed to stay on the project in a limited capacity in an advisor role. As such, he will provide feedback on draft reporting, fulfilling the final role noted in the list above.

Utility Customer Data

Enbridge and Union provided customer data for a subset of their commercial customers. This included the following information:

- NAICS or SIC code
- Business name
- Facility address
- Contact information
- Annual gas consumption

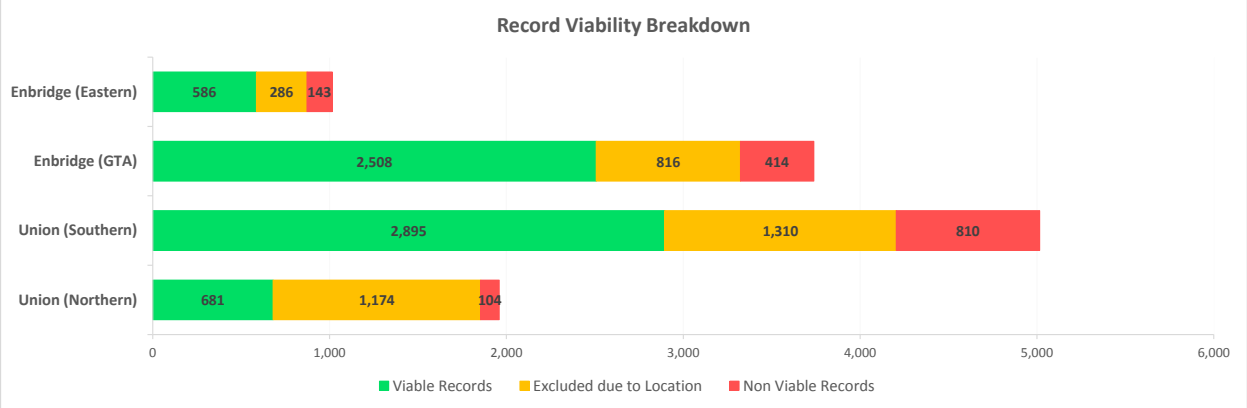
The following criteria were used to identify the subset of records within the utilities' records that had a high probability of yielding eligible boilers:

- **NAICS/SIC code:** All commercial and institutional sub-sectors were included, consistent with the definition of Commercial used for the utilities' retrofit incentive programs.
- **Boiler incentive program participation:** Exclude accounts that have participated in boiler incentive programs in the last few years (2013-2016).
- **Building types:** Including all commercial and institutional accounts, excluding restaurants, warehouses, non-food retail facilities (except large malls), and food retail facilities, since these building types are unlikely to have boilers.
- **Account start date:** Accounts created between 2005 and 2013 excluded since they are unlikely to have changed their boilers. It was subsequently decided to remove this filter as the account created date does not seem to be accurately reflected for most accounts.
- **Account Status:** Only including active accounts.

- **Minimum consumption:** Minimum annual gas consumption threshold originally set at 800 GJ (21,000 m^3). Later reduced to 640 GJ (17,000 m^3) to ensure that smaller eligible facilities aren't being excluded.
- **Location:** It was determined that it was simpler for ICF to filter out records that didn't fall within the geographical coverage area, so the utilities did not screen for this parameter. The original statement of work called for sites located in Toronto, Ottawa, Sudbury, and London to be included. This area was subsequently expanded, as described in the Site Identification section of this document.

Exhibit 1 summarizes the dataset that resulted from the screening criteria noted above. The results are broken down by utility service territory. The green bars represent records that were used for this study. The yellow bars represent records that were excluded because the locations fell outside of the geographical area selected for this study. The red bars represent records that were not considered viable for this study, mostly because there was no contact information (e.g. phone number) associated with the record.

Exhibit 1: Utility Customer Records Summary by Region



Site Identification

As summarized in Exhibit 2, ICF has contacted approximately 6,630 facilities with an overall call success rate of 0.44% (0.74% for site visit bookings in Enbridge's service territory and 0.15% in Union's service territory). This has resulted in 23 site assessment bookings of candidate facilities in Enbridge's service territory and 5 site assessment bookings in Union's service territory.[1]

[1] Referred to as candidate facilities since the number of site assessment bookings does not reflect the number of successful site visits. This is discussed further in the Site Assessments section.

Exhibit 2: Site Identification Metrics

Facilities Contacted	
Total Contacted Facilities	**6,327**
Enbridge	3,094
Union	3,233
Total Uncontacted Facilities	**343**
Enbridge	0
Union	343
Total Number of Facilities	**6,670**

Call Success Rate	
Total Number of Site Visits (Scheduled)	28
Total Number of Facilities Contacted	6,327
Success Rate	**0.44%**

Pending Site Visits	
Total Site Visits Scheduled	**28**
Enbridge	21
Union	7
Total Site Visits Completed	**28**
Total Successful Site Visits	**5**
Total Pending Site Visits	**0**
Success Rate	**18%**

ICF originally estimated a 2% success rate for the site identification stage. The lower success rate for site assessment bookings can be attributed to many factors, including:

- Data quality issues with the utilities' customer records (e.g. invalid phone numbers).
- Challenges filtering customers based on their account start date.
- Difficulties with separating out new construction facilities from the customer records.
- Most of the calls were made during the summer vacation and back to school periods, when it was more challenging to get in touch with facility contacts.
- It was more challenging than anticipated to speak directly with facility managers or other staff knowledgeable of the boiler equipment.

At the current rate of progress, ICF is concerned that there will be an insufficient number of utility records to meet the initial target of 140 site assessments. In fact, the current success rate suggests that the number of site assessment booking will be well below this number. In order to increase the success rate and overall number bookings for site assessments, ICF investigated the following possible adjustments to the eligibility criteria and survey approach:

- Extending boiler age
- Expanding geographical coverage
- Alternative leads for site assessments, including an analysis of previously contacted sites to identify sites that may result in an assessment if contacted again
- CRM analysis and re-calling previously contacted sites
- Increased site visit participant incentives

Each of these items are discussed in the following sub-sections.

Extending Boiler Age

The initial criteria for boiler age included boilers installations from January 2014. ICF investigated whether it was feasible to push back this timeline without compromising the quality of the data. It was noted that the previous minimum energy performance standards for boilers, which were superseded by changes effective Jan. 1, 2017, came into effect on July 1, 2013.[2] As such, to increase the population of eligible potential participants, ICF suggested that the eligibility criteria for boiler age be pushed back to this date. This change was determined to be reasonable by the utilities and has already been implemented by ICF.

Expanding Geographical Coverage

In the original scope of work, to minimize logistical issues and ensure that the site visits were carried out in a cost-effective way, ICF proposed that the site visits be focused on a limited number of large urban centres in each of the utilities' jurisdictions. Initially, ICF employed a 45 minute driving distance surrounding Ottawa (Enbridge Eastern region), Toronto (Enbridge Central region), Sudbury (Union Northern region), and London (Union Southern region). In order to increase the number of eligible records that our call center can contact, ICF has already expanded the number of cities so that North Bay is being considered for Union's Northern Region and cities surrounding Ontario's Golden Horseshoe region (i.e. Oakville, Burlington, and Hamilton) are being considered as part of Union's Southern region.

ICF assessed the impacts of expanding geographical coverage to nearby areas or adding additional population centers. The results of this analysis for each of the utility regions are summarized in the exhibits below, which suggest that expanding the geographical coverage would result in a total of 2,467 additional records for the site identification process. Assuming similar call and site assessment success rates, our analysis suggests that expanding the radius around representative cities will result in 16 additional site assessment bookings and the impact on travel time per site visit will be modest. Based on the current site assessment success rate, this result in an additional 2-3 site visits that result in usable data.

Exhibit 3: Impact of Expanding Geographical Coverage in Enbridge Eastern Service Territory

[2] O. Reg. 404/12: Energy and Water Efficiency - Appliances and Products, under Green Energy Act, 2009, S.O. 2009, c. 12, Sched. A, available at: https://www.ontario.ca/laws/regulation/120404

Exhibit 4: Impact of Expanding Geographical Coverage in Enbridge Central (GTA) Service Territory

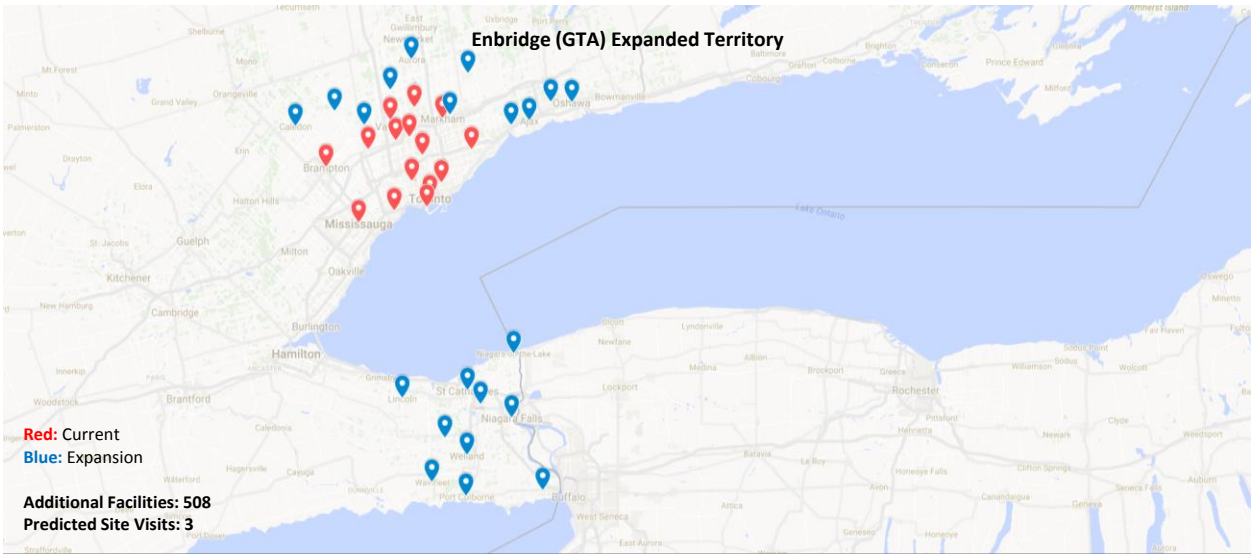


Exhibit 5: Impact of Expanding Geographical Coverage in Union Southern Service Territory

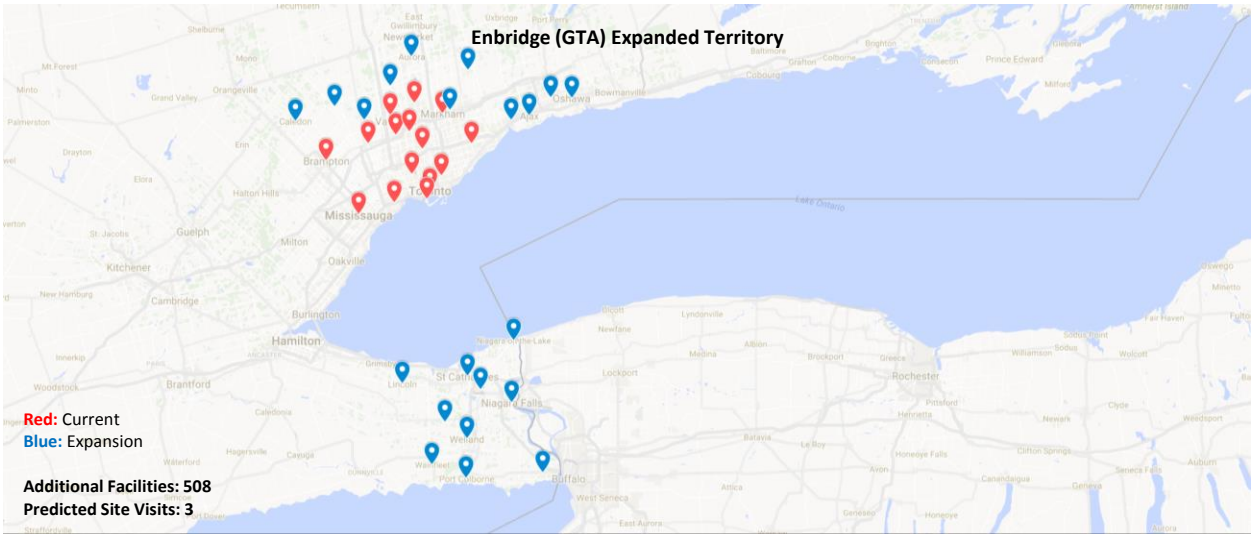
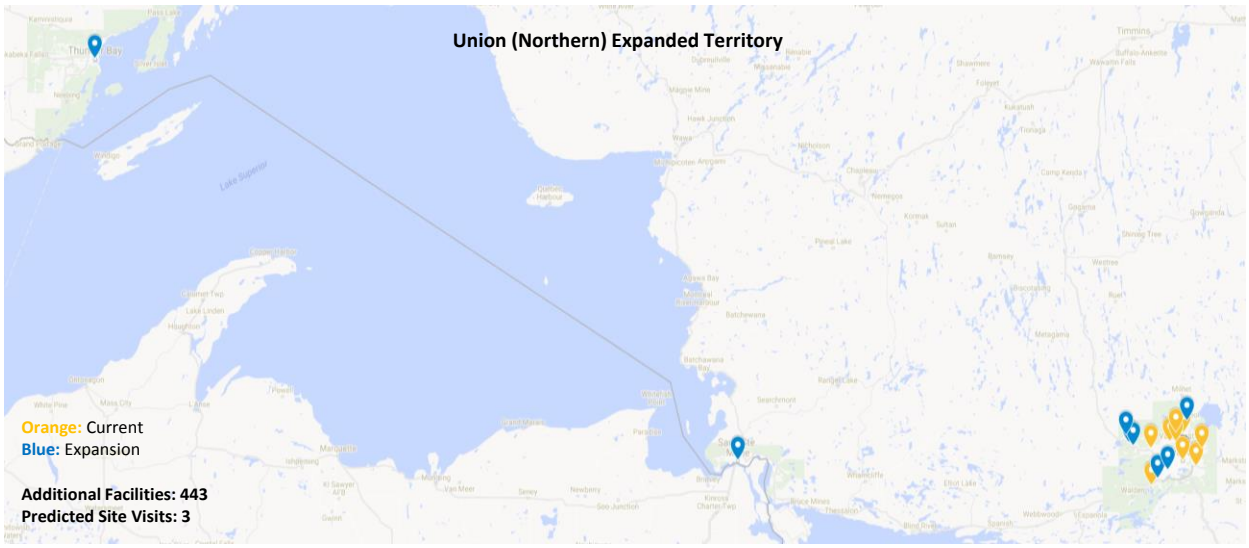


Exhibit 6: Impact of Expanding Geographical Coverage in Union Northern Service Territory



In addition, ICF assessed the impacts of expanding to all customer records provided by Enbridge and Union. However, expanding to all customer records provided by Enbridge and Union will only result in an estimated 21 additional site assessments based on our experience to date (of which 5 are expected to be successful) and will have a very large impact on travel time and costs. As such, ICF recommends that the radius around representative cities be expanded but that facilities outside these regions not be contacted.

Alternative Leads for Site Assessments:
Contacting other sources beyond customers could result in leads for potential site assessments. ICF is currently working with the utilities to identify if there are appropriate alternative leads for the site assessments from the following sources:

- Boiler contractors and engineering consultants who would know of eligible installations and could provide contact information for facilities.
- Portfolio managers with multiple facilities who may be aware of sites not previously contacted.
- Utility records pertaining to “lost” boiler projects may point towards un-incented boiler retrofits. For example, a utility customer may have begun discussions with Enbridge or Union regarding a boiler retrofit, but ultimately proceeded without completing the application process for the program and receiving incentive funding.

Providing these other sources with an incentive for providing successful leads might further encourage participation in the study and also provide a reasonable reimbursement for their effort. An initial estimate of an incentive amount that is both compelling and commensurate with the level of effort is $200 per eligible qualified lead. Additional funding would be required for this expenditure. Assuming that the eligible qualified leads for this approach would range from 30 to 65 sites and including a 10% general and administrative (G&A) fee for the disbursement of the funds, an incremental budget of $6,600 to $14,300 would be required.

Employing alternative leads to identify potential contacts for site assessments is a promising approach since it will rely on “warm leads” (i.e. sites that have completed boiler retrofits in the

required timeframe). It's also possible that all of the required sites could be identified through this approach.

CRM Analysis and Re-calling Previously Contacted Sites
ICF could analyse our contact center database to determine where calls are failing and how the process can be improved. In addition, certain sites that were contacted without success may still result in site assessments (e.g. facility contacts may have been away on summer vacation). ICF could further analyse the record set to identify these facilities.

This approach would result in additional site visits but, based on ICF's experience to date, the level of effort per identified site is likely to be quite high.

Increased Site Visit Participant Incentives
Based on the target of 140 site visits, ICF is currently offering a $20 gift card to half of the participants and a raffle to win a grand prize. ICF has identified to the utilities that there is a lack of motivation for facilities to participate in the site visit assessments and suggested that participation may improve if the incentive is increased. Based on the updated target of 70 site assessments, as discussed below, ICF recommends that the incentive to participants be increased to $100 for all participants. Including a 10% G&A fee for fund disbursement, this approach will require incremental funding of $4,620.

Some form of recognition or alternate incentive, such as a thank you letter from the utility or the offer of a free facility energy audit, may also help to boost participation. ICF is working with the utilities to investigate these options as well.

Site Assessments

As summarized in Exhibit 7, to date ICF has scheduled 28 site visits of candidate facilities, of which all 28 have been completed. However, only 5 of the completed site visits have resulted in useful data for the purpose of the study.

Exhibit 7: Site Assessment Metrics

Site Assessment Summary	
Total Site Visits Scheduled	**28**
Enbridge	23
Union	5
Total Site Visits Completed	**28**
Total Successful Site Visits	**5**
Total Pending Site Visits	**0**
Success Rate	**18%**

Findings that have contributed to the poor success rate of the site assessments include:

- **Boilers not meeting the project eligibility criteria:** In many cases, boilers have not met the project eligibility criteria (e.g. boiler too old, capacity too small, new construction application). ICF believes that this is a result of speaking to facility contacts who are not knowledgeable about their building's HVAC equipment as part of the phone screening. Many people who self-reported that they were knowledgeable about the systems reported incorrect information (e.g. incorrectly stating the boiler capacity or boiler age). Because the identity of the facility manager was not known in advance, call centre agents had to rely on the contact's assessment of whether or not they could provide the

required information. This was further exacerbated by complications with following up in situations where eligibility criteria was in doubt, as noted below.

- **Confirmation of eligibility criteria:** Challenges associated with confirming site visit bookings and/or confirming that sites meet the project eligibility criteria using follow-up calls. Since site visit participants don't stand to benefit from the visits, the initial follow-up phone calls resulted in a high number of site visit cancellations. Consequently, ICF made the decision not to follow up by phone to confirm site visit times or to follow up in cases where the eligibility of the boiler was in doubt, as was originally planned, and would normally be routine procedure for site visits. This has increased the number of site visits being undertaken, but results in a lower success rate for collected data as more sites of questionable value are included in the site assessment list.
- **Site contact availability:** In some cases, site contacts have not been available or contactable at the time of the site assessment, despite repeated attempts to make contact once on site.

ICF has made improvements to the call center scripts in order to improve the site visit success rate, but many of the parameters cannot be controlled for.

Adjustments to Sample Size

Given the challenges faced in gaining customer agreement to participate and identify eligible boiler installations, ICF proposed the possibility of reducing the current sample size. Based on a preliminary review of appropriate precision and confidence intervals, the original statement of work called for a sample of 70 hydronic boilers larger than 300 MBH used for space heating applications and 70 boilers below 300 MBH for central DHW (domestic hot water) applications. When the scope was adjusted, at the recommendation of the boiler study sub-committee, to remove DHW boilers from the study, the decision was made to increase the sample size of larger than 300 MBH boilers to 140.

Based on the estimated number of baseline boilers sold in Ontario, ICF evaluated the effects of different sample sizes on precision and confidence level. The results were provided to the utilities and are summarized in the exhibit below.

The total eligible population was estimated based on the following inputs:

- **Boiler sales:** 26,870 units larger than 300 MBH shipped across Canada for the period January 2013 to December 2016, according to CIPH. This is a reasonable proxy for the number of boilers shipped across Canada since mid-2016.
- **Ontario market share:** Estimated to be 60% of all boilers sold in Canada, considering that Ontario represents 40% of the Canadian population, and there is a relatively low penetration of natural gas in Quebec and the Maritimes.
- **Retrofit market share:** Estimated to be 66%, based on a typical boiler life of 25 years (4% of boilers being replaced in a typical year) and new construction adding approximately 2% to the commercial floor area in a typical year.
- **Incentive program participation:** Estimated to be 3,017 units for the period January 2013 to December 2016, based on Enbridge and Union program participation data.
- **Baseline boiler population:** The population of eligible boilers can be estimated by multiplying the estimated boiler shipments across Canada (26,870) by the Ontario market share (60%), subtracting the incentive program participation (3,107), and multiplying by the retrofit market share (66%). This yields an estimated population of approximately 8,650 baseline boilers.

Exhibit 8: Boiler Sample Sizes Related to Differing Precision and Confidence Intervals

Scenario	Precision	Confidence	Size
1	8%	95%	140
2	10%	90%	67
3	20%	90%	17
4	10%	80%	41
5	20%	80%	11

Approaches Considered and Rejected

The following approaches to capturing the target data set were considered and rejected for the reasons outlined below:

- **Expanding geographical coverage:** ICF investigated the impacts of expanding the geographical coverage for the site identification and site assessments to nearby areas and adding additional population centers. Based on an analysis of the records provided by the utilities, this would result in an estimated 1,806 additional records for the site identification process.
- **CRM analysis and re-calling previously contacted sites:** ICF also considered carrying out detailed analysis of its CRM and re-contacting previously contacted facilities that failed to participate, but may be eligible.

The above approaches are not recommended because of their high cost and the fact that they are not expected to yield sufficient target sights by themselves.

Recommended Next Steps

ICF recommends the following approaches:

- **Adjustments to sample size:** ICF's analysis on the effects of different sample sizes on precision and confidence level suggests that a lower number of successful site assessments may yield an acceptable dataset from the perspective of statistical significance. Based on this analysis, it is recommended that the target sample size be changed to 70 boilers, consistent with the original sample size proposed at the beginning of the project.
- **Alternative leads for site assessments:** ICF recommends pursuing alternate leads to identify candidate facilities for the site assessments including:
    - Continuing to work with the utilities to identify and contact utility account managers, facility and energy managers, boiler contractors, and "lost" boiler projects. In particular, ICF believes that reaching out to boiler contractors has the highest chance of success.
    - Providing other sources with an incentive of $200 per eligible qualified lead. This would require an incremental budget of $14,300.
    - Working with the utilities to investigate other forms of recognition or alternate incentive, such as a thank you letter from the utility or the offer of a free facility energy audit.
- **Increased site visit participant incentives:** It is recommended that the incentive to qualified site visit participants be increased to $100 per site. This would require an incremental budget of $4,620.

Project Budget

The original project budget is presented below, along with budget spent to date and budget remaining as of October 20, 2017:

Task	Original budget	Spent to date ($)	Spent to date (%)	Budget Remaining ($)
TOTAL	**$144,260**	**$125,224**	**87%**	**$19,036**
Ongoing Project Management Tasks	$14,055	$18,682	133%	-$4,627
1.0 Inception (Kickoff, Methodology, etc.)	$5,820	$6,479	111%	-$659
2.1 Sales Data Collection	$1,445	$1,255	87%	$190
2.2 Consultations with Market Actors	$9,320	$7,204	77%	$2,116
2.3 Facility ID and Pre-Screening	$36,390	$52,679	145%	-$16,289
2.4 On-Site Data Collection	$42,000	$25,936	62%	$16,064
3.1 Market Characterization	$4,110	$3,293	80%	$817
3.2 Boiler Baseline Determination	$6,500	$1,500	23%	$6,500
3.3 Draft Reporting	$4,980	$2,396	48%	$2,584
3.4 Final Deliverables	$2,960	$0	0%	$2,960
Expenses (Enhanced Data Collection)	$3,080	$0	0%	$3,080
Expenses (CIPH Shipment Data)	$1,000	$1,000	100%	$0
Expenses (ISNetworld Subscription)	$3,100	$3,100	100%	$0
Expenses (On-Site Data Collection)	$9,500	$1,700	18%	$7,800

As summarized in the table above, ICF has expended $125,224 or 87% of the project budget to date. Of this amount, $36,065 has been invoiced to Enbridge and Union.

The following items have required more effort than ICF allocated in our original budget:

- **Ongoing Project Management Tasks:** This project has required a substantial amount of project management time, based on a larger amount of client interaction than was originally envisioned and effort to address issues with the proposed approach.
- **Task 2.3 Facility ID and Pre-Screening:** The lower than anticipated success rate required with site identification resulted in more revisions to the process and script than was originally anticipated. The level of effort required to make contact with the appropriate person who could answer the eligibility criteria questions was also higher than anticipated, both in terms of number of calls made and time per call. It was anticipated that two points of contact would typically be required, with an initial call to the number associated with the account, and then a follow up call with the person responsible for maintenance. In practice, it was necessary to be transferred to several people in most cases before communicating with the appropriate person. The calls also took longer as the program requirements were discussed, and there was more hesitation and suspicion on the part of participants than anticipated.
- **2.4 On-Site Data Collection:** Data collection took more effort than anticipated primarily due to the high failure rate of site assessments, i.e. the assessments not resulting in usable data for the study. This was due to either a failure to gain access to the boiler or the boiler not meeting the eligibility criteria. Site visits were also scheduled more sporadically than originally anticipated, resulting in increased travel time per site assessment, and greater travel costs. Site assessments also took longer than expected

due to several participants not being ready when the site auditor arrived, leading to delays onsite. The inability to more thoroughly pre-screen sites, as noted previously, also contributed to this.

ICF has estimated that the following additional budget will be required to implement the recommended next steps, in addition to the remaining budget of $19,036:

TASK DESCRIPTION	TASK TOTALS
SUB-TOTAL	
Project Management	**$12,500**
Ongoing Project Management Tasks	$12,500
Task Area 2: Market and Sales Data Collection	**$61,740**
Alternative leads: ID Sites	$15,330
Alternative leads: Contact Sites	$15,330
2.4 On-Site Data Collection	$31,080
SUB-TOTAL	**$74,240**
Enhanced Data Collection	$4,620
Contractor Incentives (Qualified Leads)	$14,300
Expenses (On-Site Data Collection)	$4,750
TOTAL	**$97,910**

The additional budget estimate is based on refined estimates for the level of effort required to identify sites and conduct site assessments based on the learnings from the project delivery to date. Some high-level insights on the budget line items noted above include:

- **Project management:** Additional project management effort to account for the expanded project timeframe and more interactions with the clients to ensure the project is progressing well.
- **Alternative leads (ID Sites):** This task is related to consultations with market actors, such as contractors, to identify “warm lead” candidate facilities that have recently replaced their boilers.
- **Alternative leads (Contact Sites):** This task includes level of effort from ICF’s engineers and contact center to contact candidate facilities and follow-up to verify that they meet the eligibility criteria. ICF is proposing a more rigorous approach to site screening prior to visiting sites, which will result in a significantly higher success rate for the site visits and less overall effort for the on-site data collection.
- **On-Site Data Collection:** The updated incremental budget for the on-site data collection assumes 4 site visits for day, allowing for more travel time between sites and for sufficient time to comprehensively catalogue the information on each boiler. Based on a more rigorous approach to site screening prior to site visits, ICF has also assumed a 75% success rate for site visits going forward.

The changes made in the proposed approach represent ICF's best efforts to incorporate all of the lessons during the delivery of the project to date, including valuable insights and recommendations from the utilities.

Project Schedule

Unforeseen circumstances have resulted in delays to the overall project timeframe. For example, Mr. Bach's departure from the project caused a delay of approximately 4 weeks in the start of the site visits since he had been tasked with leading the development of the site auditor training material shortly before his departure. Most impactful however, challenges with identifying eligible facilities for the site assessments have resulted in significant delays.

There is some uncertainty on the impact of the further delays since ICF will have to implement alternate approaches to identifying eligible facilities for the site assessments. ICF anticipates that the project completion, which was originally scheduled for late October 2017, will be delayed by an estimated 4-6 months. Despite these delays, ICF is committed to satisfying the overall project goal of characterizing baseline boilers in Ontario at an acceptable level of statistical significance.

MEMORANDUM

To: John DeVenz and Deborah Bullock, Enbridge
Leslie Kulperger, Union Gas

From: John Dikeos and Nick Ebbs, ICF

Date: March 21, 2018

Re: Hydronic Boiler System Baseline Study: Enhanced Approach

Background

ICF's original approach for identifying facilities with eligible boilers for the purposes of the Hydronic Boiler Baseline Study yielded limited success; despite contacting over 6,600 facilities, we were only able to book 28 site visits and only 5 of the completed site visits resulted in useful data for the purpose of the study (i.e. only 5 sites had boilers that met the eligibility criteria).

The memo outlines ICF's proposed enhanced approach, including an updated schedule and draft email templates for our consultations with boiler contractors. Due to the challenges ICF has encountered with this project thus far, it is important to note that ICF is proposing a staged "exploratory" approach where progression to subsequent phases is contingent on success in earlier phases. Additional challenges may merit discussions with Enbridge and Union Gas staff on alternate approaches and/or whether it is worthwhile to proceed to subsequent phases. It should be noted that, even with the enhanced approach, there is a risk the project will be unable to meet the study criteria and will be deemed unsuccessful.

Enhanced Approach

Based on the alternate approaches that ICF investigated, as outlined in ICF's memo dated Oct. 23, 2017, and the feedback that has been provided by Enbridge and Union Gas, ICF is proposing to move forward with implementing the following alternate approach for this study:

- **Adjustments to sample size:** ICF's analysis on the effects of different sample sizes on precision and confidence level suggests that a lower number of successful site assessments is expected yield an acceptable dataset from the perspective of statistical significance. Enbridge and Union Gas have agreed to revise the target sample size to 70 boilers, as this sample size is consistent with the original scope of work, as well as being consistent with industry standards for the statistical significance of surveys.

- **Alternative leads for site assessments:** ICF will pursue alternative leads to identify candidate facilities for the site assessments (i.e. to identify "warm leads"). We will work to identify boiler contractors, property management groups, and "lost" utility boiler projects.[1] However, ICF will focus primarily on reaching out to boiler contractors since we believe that this approach has the highest chance of success.
- **Incentives:** We will offer incentives to both site visit participants (i.e. $200 per site) and boiler contractors or other market actors that provide eligible qualified leads (i.e. $200 per eligible qualified lead) for a total of 5 eligible qualified leads per boiler contractor to ensure the study is not biased.
- **Calls to candidate facilities:** Pending the success of our approach to identify "warm lead" candidate facilities, we will leverage our in-house contact center to complete calls to these facilities. Based on lessons learned from this project and similar recent projects, ICF has improved its contact center staff training for these types of engagements and has a better overall process in place. We are confident that this will help improve the overall success rate of our calls to candidate facilities. Where it's deemed to be beneficial and cost-effective, our consultants will be involved in training contact center staff and completing a portion of the calls to candidate facilities.
- **Pre-site visit confirmation of eligibility criteria:** To improve the success rate of our site visits, ICF will implement a more rigorous pre-screening approach for the pre-site visit confirmation of eligibility criteria. For instance, calls to confirm eligibility criteria will be completed by our consultants to ensure that we are able to properly gauge facility contacts' knowledge of their boiler systems. ICF will also attempt to confirm site visit bookings in advance of sending staff to any sites. This was not possible using the original "cold call" approach, as the site contacts were easily discouraged from participating if contacted too frequently.

Furthermore, ICF is proposing a multi-pronged approach to confirm that boiler installations were not influenced by gas incentive programs:

1. **Boiler contractors:** First, this will be listed as one of the criteria for the facilities being identified by the boiler contractors
    - If the boiler contractors are unsure, they may provide ICF with some leads that include DSM participants but these will be weeded out in subsequent steps
2. **Utilities:** Next, the draft list of facilities will be provided to Union and Enbridge so that the Gas Utilities can cross-reference with their participant databases
3. **Facility managers:** Lastly, ICF will confirm with facility managers as part of the screening process and during site visits that their boiler retrofits weren't influenced by gas incentive programs

[1] "Lost" boiler projects are utility customers that may have begun discussions with Enbridge or Union regarding a boiler retrofit, but ultimately proceeded without completing the application process for the program and receiving incentive funding. Such projects will be carefully vetted to ensure that they can reasonably be considered to have not been influenced by utility DSM initiatives.

Updated Schedule

A draft schedule for executing the enhanced approach is outlined in the table below. Subsequent stages are dependent on the success of previous stages. For example, ICF will move to carrying out calls to candidate facilities if a critical mass of "warm" leads is generated by the alternative leads for site assessments.

Task	Approx. Timeframe	Mar-23-18	Mar-30-18	Apr-06-18	Apr-13-18	Apr-20-18	Apr-27-18	May-04-18	May-11-18	May-18-18	May-25-18	Jun-01-18	Jun-08-18	Jun-15-18	Jun-22-18	Jun-29-18	Jul-06-18	Jul-13-18	Jul-20-18
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stage 0: Compile list of alternative leads (primarily boiler contractors)	3 weeks																		
Stage 1: Alternative leads for site assessments (i.e. generate "warm" leads)	6 weeks																		
Stage 2: Calls to candidate facilities	5 weeks																		
Stage 3: Site visits	5 weeks																		
Stage 4: Draft reporting	3 weeks																		

Boiler Contractor Email Template: First Contact

Subject: $200 Incentive Offer to Support Boiler Baseline Study

Hi xxxxx,

On behalf of Enbridge and Union Gas, we are offering a **$200 referral incentive** for each lead that helps us identify a recent boiler installation that meets our eligibility criteria. You can claim these referral incentives by helping us identify a few eligible sites that we could visit from the list of clients you have worked with recently. Your **customers will also receive a $200 incentive** for each successful site visit.

These incentives are being offered as part of a research study to collect market data on recent hydronic boiler installations in Ontario. As part of this effort, we are identifying recent boiler installations and carrying out on-site data collection of boilers that meet our eligibility criteria. Your assistance in identifying eligible sites would be much appreciated and will also be useful in helping the Enbridge and Union Gas improve their future incentive programs.

If you are interested in providing site information to us and to coordinate next steps, please contact me at xxxxx.xxxxx@icf.com or by phone at xxx-xxx-xxxx.

Regards,
xxxxx

Boiler Contractor Email Template: Established Contact

Subject: $200 Incentive Offer to Support Boiler Baseline Study

Hi xxxxx,

Thanks for your interest in participating in the study we are working on to collect market data on recent hydronic boiler installations in Ontario. As I noted, we appreciate your support to help us identify a few eligible sites that we could visit from clients you have worked with. This would entail a brief visit by one of our staff to take a look at the boiler, and to record information on the thermal efficiency and other boiler features.

We are looking to identify facilities that have installed one or more boilers that meet the following criteria:

- Must be a space heating hot water boiler
- Must have a capacity greater than 300 MBH
- Must have been installed after June 30, 2013
- Must have replaced existing boilers (i.e. not new construction)
- Boiler installations did not receive an incentive from Enbridge or Union

As a reminder, we are offering a **$200 referral incentive for each successful site lead** (up to a maximum of 5 sites) that you are able to provide to us. Your customers will also receive a $200 incentive for a successful site visit.

Thanks again for your interest in assisting with this study and please let me know if you have any questions.

Regards,
xxxxx

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, pp. 6-7

Preamble: Union Gas states: The 2015 EM&V process took approximately 19 months to complete. This is approximately nine months longer than the duration of historical utility coordinated audits, despite the fact that historical processes were subjected to the scrutiny of consensus-based Audit Committees on all aspects of the audit, including selection of the auditor.

Question:

a) Related to the 2015 EM&V process, please indicate when OEB staff provided Union Gas with the non-disclosure agreement (NDA) for signature for Union Gas to release data required for evaluation activities, and when Union returned the signed document to OEB staff and DNV GL.
b) Please indicate the length of time Union Gas required to fulfill all data requests made by the EC to facilitate the evaluation of Union Gas's DSM programs. Please specify the date that the last set of data was provided to the EC.
c) Please indicate whether or not Union Gas was provided with an opportunity to review/provide input on all major deliverables of the evaluation project. If yes, please indicate, in total, the amount of days Union Gas was provided for this review.
d) Please provide Union Gas' 2012, 2013, 2014 Auditor's Reports and Audit Committee Reports.
e) Please describe the extent to which the auditor selected by the Audit Committee performed primary research as well as other robust evaluation studies in order to inform the results demonstrated in the 2012, 2013, 2014 Auditor's Reports.

Response:

a) Please see response at Exhibit B.Staff.2 a).

b) Please see response at Exhibit B.Staff.2 b).

c) Please see response at Exhibit B.Staff.2 c).

d) The 2012, 2013, and 2014 Auditor's Reports and Audit Committee Reports can be found at the following links:
   - 2012 Auditor's Report and the Audit Committee Summary Report

  - https://www.oeb.ca/documents/2012_UGL_DSM_Audit_Documents.pdf
- 2013 Auditor's Report and Audit Committee Summary Report *(contained within Union's 2013 DSM Deferrals Application as filed with the OEB December 1, 2014 at Exhibit B, Tab 2 and Exhibit B, Tab 3)*
  - http://www.rds.oeb.ca/HPECMWebDrawer/Record?q=CaseNumber=eb-2014-0273&sortBy=recRegisteredOn-&pageSize=400
- 2014 Auditor's Report and Audit Committee Summary Report *(contained within Union's 2014 DSM Deferrals Application as filed with the OEB December 9, 2014 at Exhibit B, Tab 2 and Exhibit B, Tab 3)*
  - http://www.rds.oeb.ca/HPECMWebDrawer/Record?q=CaseNumber=eb-2015-0276&sortBy=recRegisteredOn-&pageSize=400

e) Primary research is not a requirement of a successful DSM audit. Primary research was historically undertaken through the verification process in advance of the auditor's review of the results. The verification activities undertaken in 2012, 2013 and 2014 are detailed at Exhibit B.Staff 7 b) and were incremental to the program areas verified in the 2015 EM&V process, which focused solely on the Commercial, Industrial and Large Volume Custom Programs.

Additional evaluation work would have been commissioned by the TEC and provided to the auditor for review. During the 2012-2014 Framework, the evaluation work and the annual audit process were bifurcated to ensure the annual audit process was not overly burdened and also to engender greater synergies between the Enbridge and Union.

Auditors selected by the audit committee for the 2012, 2013 and 2014 DSM audits completed other evaluation activities to the extent they deemed appropriate in order to comply with the following declaration:[1]

> *"We conducted our audit in accordance with the rules and principles set down by the Ontario Energy Board in the DSM Guidelines for Natural Gas Utilities (EB-2008-0346) and in accordance to the contents of the Union Gas Settlement Agreement (EB-2011-0327). Details of the steps taken in this audit process are set forth in the Audit Report that follows, and this opinion is subject to the details and explanations therein described.*
>
> *In our opinion, and subject to the qualifications set forth above, the following figures are calculated correctly using reasonable assumptions, based on data that has been gathered and recorded using reasonable methods and accurate in all material respects, and following the rules and principles set down by the Ontario Energy Board that are applicable to the [program year] DSM programs of Union Gas Ltd:*
>
> *DSM Shareholder Incentive Amount Recoverable - $xxxx*

[1] EB-2015-0276, Union Application, Exhibit B, Tab 3, 2014 Audit Committee Summary Report Final, p. 13

LRAM Amount Recoverable - $xxxx
DSMVA Amount Recoverable - $xxxx"

In each of the 2012-2014 years, the audit committees achieved consensus in supporting the findings of the audit.

The audit reports provided in response to part d) above provide detail on all activities conducted by auditors in 2012, 2013 and 2014. Below is a summary of these activities:

2012 Audit Activities

- Audited the Draft 2012 DSM Annual Report to identify if there were claims made that were not substantiated.
- Addressed issues raised by the Audit Committee during the audit process.
- Reviewed Union's procedures to track program participants and determine whether they lead to accurate counts.
- Reviewed Union's tracking system procedures and a sample of tracking system inputs.
- Reviewed substantiation sheets and supporting research and documents for Prescriptive and Quasi-Prescriptive Measures to confirm algorithms and assumptions were reasonable.
- Reviewed third party verification studies of installation and retention of measures in the Residential Energy Savings Kit ("ESK"), the Low Income and Commercial Hot Water Conservation (HWC) programs and ensured they were properly applied to savings.
- Reviewed third party verification studies of samples of custom projects for Large Industrial, Commercial/Industrial, and Low Income. Reviewed the calculation of the population realisation rate and the associated precision to ensure it met OEB requirements.
- Reviewed the data and calculations for deep savings to ensure they were accurate and conformed to the Settlement Agreement.
- Reviewed the Scorecard calculations to ensure they were accurate and conformed to the Settlement Agreement.
- Reviewed and verified calculations of the Market Transformation claim and commented on metrics.
- Reviewed and provided an opinion of the DSMVA account.
- Verified that the claimed savings for LRAM were accurate, consistent with the Settlement Agreement, and were based on the best available information at the time of the audit.

2013 and 2014 Audit Activities

- Reviewed Union's Audit Tool to verify program participant counts were accurate.
- Reviewed third party survey instruments and survey results that examined the installation and retention of measures in the ESK program and HWC.
- Reviewed Union's Audit Tool and supporting documentation for Prescriptive and Quasi-Prescriptive Measures to ensure that all algorithms and prescriptive values were used

correctly to calculate the savings and were consistent with program documentation filed with the OEB.

- Reviewed deep savings measure savings values and calculations for accuracy.
- Reviewed Scorecard values and calculations for accuracy.
- Reviewed third party verification studies that examined a sample of custom projects for Large Volume, Commercial/Industrial, and Low Income customers.
- Reviewed and verified that the LRAM claimed savings values are accurate, consistent with the Settlement agreement, and based on the best available information at the time of the audit.
- Considered and addressed issues raised by the stakeholders during the audit process, including those of the Audit Committee.

A listing of additional verification and evaluation activities undertaken in the previous framework are further detailed at Exhibit B.Staff 7 b).

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 8
Exhibit A, Tab 2, p. 11

Preamble: Union Gas states: The audit adjusted $7.472 million DSM incentive claimed in this Application uses a 46% custom program NTG adjustment factor (please see Exhibit A, Tab 3, Appendix A, Schedule 4). Use of this factor to calculate DSM incentive amounts is appropriate and consistent with the original and revised OEB Decision and Order on Union's 2015-2020 DSM Plan. In contrast, the audited DSM incentive amount is inconsistent, because it:
a) Does not reflect the original and revised OEB Decision and Order;
b) Calculates 2015 audited DSM program results using different NTG factors than those used to calculate the OEB-approved 2015 targets;
c) Is inconsistent with the scope of the original NTG Study Request for Proposal; and
d) Uses results from the incomplete and ongoing NTG Study.

And

Union Gas states: Union's approach to setting its 2015 targets was consistent with this direction as it used input assumptions that were the result of the 2014 program EM&V. Specifically, Union used 2014 post-audit results, including the 46% NTG adjustment factor for Union's Commercial Industrial ("CI") and Large Volume custom programs, to establish its 2015 targets.

Question:

a) Please cite the jurisdictions which do not leverage best-available information when developing final estimates of efficiency program impacts and performance incentives as well as whether or not these jurisdictions' decision to not use best-available information has been sanctioned by their regulator.
b) Union Gas indicates its current NTG assumptions for their Commercial Industrial and Large Volume custom programs are based on the results of the 2014 evaluation process.
    i. Please provide a copy of the study that established the NTG value.
        1. If not included in the study report, please provide documentation showing details of the methodology used to develop the NTG estimate (e.g., the final scope of work)
    ii. Please indicate the date this study was completed.
    iii. Please provide copies of the calculation workbooks used to determine the NTG values in this study.

iv. Since the completion of that study, what efforts has Union Gas undertaken in order to understand how effectively their DSM programs have been delivered to market?
v. What studies or other research has Union Gas initiated in order to ensure DSM programs achieve the high levels of performance and continually deliver ratepayer value?
    1. If applicable, how has Union Gas reflected the findings, insights or lessons learned from these studies into their program design and delivery strategies?
    2. If such studies have not been completed, why not?

c) If not for the 2015 program year, when does Union Gas believe the results of NTG study completed by DNV GL should be used to calculate program performance?

Response:

a) Union did not undertake a global analysis or research on DSM policy mechanisms applied and sanctioned and is not in a position to answer this question.

Union's application at Exhibit A, Tab 2, p. 8, and at Exhibit A, Tab 2, p. 11, refer to Union's position that the use of the 46% NTG value as an input assumption to calculate the 2015 DSMI was appropriate for two reasons: i) it was used to establish targets; and, ii) it was approved through the previous year's audit.

In its Report of the Board on the 2015-2020 DSM Framework, the OEB states that in order to effectively estimate the amount of energy savings achieved through the delivery and implementation of DSM programs, the gas utilities rely on a set of approved engineering assumptions that represent the best available information regarding various characteristics of an energy efficient technology (e.g., life cycle, energy usage level, gas savings, etc.).[1] This supports Union's position that targets should set using the best available information and subsequently that the results of the NTG Study should be applied prospectively to targets and results of future DSM program years.

b) To clarify, Union stated that its current NTG assumptions for the Commercial Industrial and Large Volume custom programs were drawn from the results of the 2014 EM&V process.

i. Please see Exhibit B.Staff 5.Attachment F, pp. 25 – 158.

ii. October 31, 2008.

iii. Union does not have a record of the calculation workbooks used in the study and cannot confirm whether or not they were ever provided.

[1] EB-2014-0134, Report of the Board, p. 31.

iv. Establishing evaluation priorities for Union has been the mandate of the intervenor collaborative process for more than ten years. In accordance with, and in response to, the 2006 DSM Generic Proceeding, the first Evaluation & Audit Committee was created. This committee was responsible for establishing evaluation priorities annually as well as for providing input and advice through the audit process. In 2010, Union's Evaluation & Audit Committee determined that conducting a CI Custom Program process evaluation was a priority. This evaluation was subsequently completed on June 30, 2011.

v. As noted in part iv) above, evaluation priorities were established in consultation with Union's Evaluation and Audit Committee until such time that the establishment of evaluation priorities was transitioned to the joint Union and Enbridge TEC in 2012 as a part of the stakeholder engagement process that was developed in response to the 2011-2014 DSM Framework. This responsibility now rests with the Evaluation Advisory Committee with support from Board Staff.

From 2006-2010, the Evaluation and Audit Committee established that the following verification studies should be undertaken annually as priorities and be provided as part of the annual audit process:

- Residential ESK "Push" (showerhead, faucet aerators for bathroom and kitchen, pipe insulation)
- Residential ESK "Pull" (showerhead, faucet aerators for bathroom and kitchen, pipe insulation)
- Residential ESK "Installed" (showerhead, faucet aerators for bathroom and kitchen, pipe insulation)
- Residential Programmable Thermostats
- Low Income Installed Helping Homes Conserve (showerhead, faucet aerators for bathroom and kitchen, pipe insulation)
- Low Income Programmable Thermostats
- Low Income Home Weatherization Program (launched in 2009)
- Commercial Hot Water Conservation Program
- Commercial Custom Program
- Industrial Custom Program

The EAC also prioritized the following evaluation studies during the same timeframe:

- Resource Savings Values in Selected Residential DSM Prescriptive Programs (2008)
- Residential Measure Free Ridership and Inside Spillover Study (2008)
- Custom Attribution Study (2008)
- Impact of OBC 2006 on Union Gas DSM Measures (2008)
- Free-ridership and Spillover for Low-flow Pre-rinse Spray Nozzle (2008)
- Boiler Base Case Efficiency (2009)
- Deemed Savings for (Low Flow) Pre-Rinse Spray Nozzles (2009)
- Evaluation of Infrared Heaters (2010)
- Evaluation of Energy Recovery Ventilators & Heat Recovery Ventilators (2010)
- Evaluation of Infrared Heater Market Share (2010)
- Process Evaluation - Commercial & Distribution Contract Custom Project Programs (2010/11)
- Union Gas DSM Custom Project Documentation Parameters (2010/11)

Since the establishment of the TEC in 2012, the following evaluation activities have been undertaken:

- CI Custom Sampling Methodology (2012)
- CI Custom Project Savings Verification Process (2012)
- Input Assumption Filing update (EB-2012-0441)
- Creation of joint Technical Reference Manual (2013)

- CI Custom Free Rider Jurisdictional Scan (2013)
- Technical Reference Manual creation (2014, 2015)
- CI Custom NTG study initiated (2014/15)
- Joint Terms of Reference for Custom Projects Savings Verifications (2014)
  Commercial Boiler Baseline Study RFP (2015)

1. All findings from these studies have been adopted by the programs and/or reflected in the program results as appropriate, all of which is outlined in Union's annual reports.

2. Please see the studies summarized above, which were all complete, in addition to the explanation on the process for establishing evaluation priorities noted in part iv) above.

c) As noted in Union's application at Exhibit A, Tab 2, p. 9, the OEB's Decision on Union's 2015-2020 DSM Plan holds that the OEB does not expect the gas utilities to rely on predetermined NTG adjustment factors as it directed the NTG Study result to be updated in 2016 and effective for the 2017-2020 DSM program years.

It is Union's position that the 2015 NTG Study should be used to inform program design for future years. The objective and approach noted by DNV GL in the original Scope of Work provided to the TEC, dated March 2, 2016, demonstrates the study was not intended to be applied retroactively:[2]

Evaluation Objectives
The overall goal of this evaluation is to develop transparent free ridership and spillover factors for custom commercial and industrial programs to be used for future programs.

Evaluation Approach
The methodology selected for this evaluation will rely on end-user self-report surveys and interviews to estimate program NTG. The end user self-reports will be supplemented by project-specific interviews with vendors and vendors to capture indirect effects of the program on end-user decision making. Surveys and interviews will be collected from the most recent program years in order to create NTG factors that will be most meaningful for future years.

[2] Exhibit B.Staff.05.Attachment D, p.5

It is Union's position that the results of the study should inform future program design and be reflected in the targets for subsequent DSM program years.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 14

Preamble: Union Gas states: To date, only results of the Free Rider component of the NTG Study are available, the Spillover component remains in-field, and Secondary Attribution findings were not applied to utility results by the EC.

Question:

a) Within Navigant's report provided at Exhibit A, Tab 2, Navigant documents how leading jurisdictions define NTG. Given only Massachusetts and not Illinois and California include secondary attribution in their calculation of NTG, why does Union Gas believe this factor should be included in its NTG estimate?
b) How was the EC's decision not to consider secondary attribution inconsistent with best practice?

Response:

a) and b)

DNV GL's NTG Study Scope of Work clearly contemplates inclusion of Secondary Attribution (please see Exhibit B.Staff.5.Attachment D and Exhibit B.Staff.5.Attachment E). Excluding Secondary Attribution from the NTG estimate is inconsistent with the NTG Study Scope of Work.[1]

.

[1] Exhibit A, Tab 2, p. 14

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 16

Preamble: Union Gas states: The EM&V process has lacked the collaboration, transparency, and predictability outlined by the OEB in its justification for coordinating the process, and the regulatory efficiency and stability expected by Union.

Question:

a) Union Gas indicates that there was a lack of transparency and collaboration between OEB staff and members of the EAC. Is this Union Gas' view, or is Union Gas speaking on behalf of the EAC? Please indicate the members of the EAC you consulted who also believe the process lacked transparency and collaboration.

Response:

a) Union confirms that the concerns expressed in its application are its own. Union cannot speculate on the opinion of other members of the EAC.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 1, p. 5
Exhibit A, Tab 2, p. 24

Preamble: Union Gas states: Shortfalls persist beyond the 2015 EM&V process with the utilities not being supplied the supporting information required to accurately forecast, accrue and track EM&V related costs.

And

Union Gas states: Union is concerned with the lack of transparency regarding budgets and costs for the EC's 2015 EM&V activities. The EC was hired through a multi-year contract with the OEB but the details of this contract (including budgets) has not been shared with the utilities. However, the utilities are expected to pay for this work using their respective EM&V budgets, which are approved by the OEB and ultimately paid for by customers. Withholding proposals and related budgets from the utilities is not a reasonable approach to EM&V coordination since the utilities are dependent upon budget information for contract payment, completion of program planning, and financial reporting. Under the current process Union has lost the ability to track and accurately accrue related costs. This has created an environment of uncertainty and made management of evaluation budgets, which can be used for other evaluation activities, needlessly difficult.

Question:

a) Please confirm that OEB staff provided Union Gas, when requested, with accrual amounts to assist them with managing their evaluation budgets.
   i. Please confirm that accruals were provided at least twice annually, in March and December of each year.
b) Please indicate what contract payments Union gas is referring to in the text above.
c) Please indicate what utility-led process evaluations Union has funded since January 1, 2015.
   i. Please indicate the cost of each evaluation.
d) Please explain what "completion of program planning" refers to in the text above.

Response:

a) There are two distinct issues embedded in this question; timely provision of accrual amounts and management of budgets. Union confirms that OEB Staff provided certain information on

accrual amounts upon request but in some instances the information was inaccurate and contained insufficient detail.

i. Accrual information was provided once in 2016 (in December) and twice in 2017 (in February and December).

The accrual accounting method ensures costs are reported in the period that they are incurred. Year-end accruals assign costs in one fiscal year and create an offset so that the payment of the actual invoices does not impact the following year's budget, except where estimates were inaccurate. Accruals should also be recorded throughout a current year (at least quarterly) where amounts are material. It is essential that all costs are recorded in the proper period and fiscal year to ensure that deferral balances and cost recoveries from rate payers are calculated appropriately and financial reporting adheres to Generally Accepted Accounting Principles ("GAAP").

Information provided regarding accruals did not satisfy these requirements in two main ways:

1. Union was unable to obtain correct information to properly reconcile the invoice payments related to 2016 accruals. The information provided in 2017 to confirm clearance of the 2016 year-end accrual records was inaccurate and inconsistent. Subsequently, Union had to create further accounting entries to correct the 2016 year-end accrual accounting transactions occurring in 2017 and, in doing so, overturn historical financial recording practice that allocated costs by program.

2. Accruals were not made throughout the year although the value of work performed was likely material. Since Union is not coordinating or managing the evaluation contracts, Union needs to be advised by OEB Staff when monthly or quarterly accruals are necessary given the value of the work performed in the period.

With regards to management of budgets, Union requires projected budget amounts related to a year's EM&V activities in advance of the work to effectively plan and manage evaluation expenditures. This information was not received until August, after repeated requests, and was ineffective due to issues in reconciling the information provided. Lack of complete and timely budget information also prevents Union from undertaking other evaluation work, such as process evaluations.

Further, Union believes full transparency in budgets and spend is necessary so that the EAC, in its advisory role, can effectively provide guidance on the proposed cost of audit and work deliverables, the prioritization of other evaluation activities and studies, and cost/benefit improvements for the following year's audit.

For illustrative purposes, in addition to the issues outlined above, context on the primary difficulties related to the EM&V accrual and budget information is summarized below.

- Union was unable to reconcile the overall accrual amount to the invoices provided. Table 1 lists the OEB invoice details paid in 2017.

Table 1

OEB Invoice	Invoice Date	
Description	July 2017	October 2017
OEB's cost before April 1, 2017	$ 122,844.00	$ 117,159.00
OEB's cost after April 1, 2017	$ 136.00	$ 84,499.00
Total	$ 122,980.00	$ 201,658.00

Union accrued $198,325 at the end of 2016 related to 2015 EM&V activities.

OEB Staff indicated in a February 2017 email exchange that the totality of accruals (EAC and DNV GL costs) should be settled by mid-May. Based on this information, Union continued to enter transactions to correctly re-accrue the costs monthly.

However, when the first OEB invoice was received in July, the amount was $122,844. This implied an over-accrual of $75,481 ($198,325 - $122,844). OEB Staff confirmed this to be the case in early August and Union stopped processing the additional transactions required to re-accrue these amounts, understanding it was an estimate error. The October invoice and subsequent conversations revealed this not to be accurate and EM&V work conducted in 2016 (related to 2015 audit) was included in the October invoice amount. 2017 monthly financial reporting would have been misstated by the variance due to the provision of piecemeal and incomplete information.

Since the date of before or after April 1st does not align with work performed, Union was unable to get details on the status of costs specifically related to the 2016 accruals. The total billed costs for before April 1, 2017 are $240,003. Union can only assume there was not an over or under accrual for 2016, but cannot confirm this.

- Aside from reconciling the overall amount, Union also could not obtain classification of costs to align to the accrual. December 2016 accrual amounts were based on work-completed estimates provided by DNV GL separated by program to align with Union's OEB-approved budget structure, which allocates budget at the program as well as portfolio levels. The corresponding OEB invoices provided no detail except "consulting". Despite repeated attempts, Union was unable to obtain any further details on the invoices to compare to accruals made by program and was similarly unsuccessful in obtaining much information on the amount by work deliverable aside from "EC" versus "CPSV" at an aggregate level. The costs of other evaluation work products, such as TRM, are unknown and included in the overall "EC" costs.

- In August, OEB Staff provided the following budget information related to the 2015 evaluation work conducted in 2016 and 2017 (i.e. the full cost of the 2015 evaluation):

	2016	2017			
	Actual	Projected	**Total**	**Paid to date**	**Remaining**
Union	$ 74,983	$ 320,065	$ 395,049	$ 122,555	$ 272,494

Subsequent exchanges did clarify this was based on timing of invoices to OEB Staff and not work performed. However, Union could not obtain the costs to reconcile and thus does not have confidence in the estimates. As shown in the response at Exhibit B.BOMA.9, total EC/CPSV costs related to 2015 evaluation recorded by the end of the 2017 fiscal year totaled $487,159. This is $92,110 higher than projected just four months previously. Union was unable to obtain reliable budget information in a timely manner and cannot account for the variance.

Accurate, timely and transparent information is necessary for the effective management of budgets and to comply with financial accounting and reporting requirements. It also ensures funds are available to support evaluation priorities and provides benchmarking for continuous improvement in the scope of evaluation activities and vendor selection.

b) Union is referring to having full knowledge of OEB Staff coordinated EM&V project budgets expected to be spent throughout the year for planning, forecasting and tracking purposes as well as having sufficient supporting information when approving invoices for payment.

c) Please see the response at Exhibit B.Staff.11 b).

d) EM&V costs enter into TRC, TRC-plus and PAC cost-effectiveness calculations. As per the OEB's Decision on Union's 2015-2020 DSM Plan, Low Income programs should have a TRC-plus ratio of at least 0.7 while Resource Acquisition programs should have a TRC-plus ratio of at least 1.0.[1]

Managing programs to ensure they are above their respective TRC-plus thresholds is an important part of program planning. Without accurate information on EM&V budgets, costs and their allocation to each program, planning for programs to meet their respective TRC-plus thresholds is difficult.

Completion of program planning also refers to all of the activities undertaken within a year to forecast the performance of a program(s) while balancing use of DSMVA funding and ensuring cost-effectiveness throughout the portfolio.

[1] EB-2015-0029, Decision, p. 9

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 27

Preamble: Union Gas states: These delays have also effectively created a new barrier to lowering Free Ridership as the utilities have not received actionable Free Ridership mitigation recommendations from the EC in a timely manner. One method by which Union can reduce Free Ridership within its custom offerings is by enhancing program design and implementation practices to include new Free Ridership mitigation efforts. One source of new Free Ridership mitigation efforts comes from feedback provided through the EM&V process. As part of this process, the EC and/or CPSV consultant provides an in-depth review of Union's custom offerings, integrates knowledge and expertise from other jurisdictions, and provides feedback that can be incorporated into program design.

Question:

a) Please confirm that insights to enhance program design and implementation practices are outcomes of process evaluation.
b) Why is Union Gas reliant on the impact evaluations completed by the EC to provide process evaluation related insights?
c) Please describe all process evaluation related efforts Union Gas has undertaken in the last 3-years to ensure program performance is optimized.

Response:

a) Confirmed. However, other EM&V activities, including impact evaluation, can provide insights to enhance program design and implementation practices.

   While process evaluations do more extensively focus on and provide recommendations on the effectiveness of a program and identify opportunities to enhance design, historically, annual DSM audits and related impact evaluations have also included recommendations relating to the custom program design, particularly in relation to Free Ridership mitigation. In the past, Union worked with the AC to summarize these recommendations relating to custom program design and, through achieving consensus, identified how the recommendations would be addressed. These conclusions were then documented in an AC Summary Report and filed with the OEB as part of Union's application for deferral disposition.

b) Union is not solely reliant upon the annual audit process to provide program recommendations. Rather, as evaluation related project and budget spend prioritization was

determined by the TEC under the previous DSM Framework and because process evaluation was not a TEC priority, Union reviewed and leveraged the program advice made available through the annual EM&V process. Union's EM&V Plans filed in the 2015-2020 DSM Plan noted that process evaluations would not occur until a year after the new offering cycle completed (i.e. in 2017).[1] Union did not undertake any studies in 2017, as it lacked timely information on anticipated 2017 budget spend.

c) As noted in the response to part b) above, process evaluation was not identified as an evaluation priority by the TEC during the previous DSM Framework. Union has not undertaken process evaluation related efforts in the last 3 years.

[1] EB-2015-0029, Exhibit A, Tab 3, Appendix C

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 28

Preamble: Union Gas states: Since the EC's work deliverables were provided to the EAC after the OEB Staff comments were incorporated, the impacts of the comments on the EC's deliverables, methodologies, and Scope of Work are unknown.

Question:

a) Please confirm that the work deliverables referred to by Union Gas were not presented to EAC members as final deliverables, and that all EAC members had an opportunity to provide input on these work deliverables before final versions were approved.
b) Please confirm that, in response to concerns raised by the EAC, OEB staff changed their process so that they no longer review documentation from the EC in advance of other EAC members.
c) Please confirm that OEB staff documented this change in the draft EAC Terms of Reference.

Response:

a) Confirmed.

The EC did release subsequent draft work deliverables after OEB Staff had the advanced opportunity to comment on first draft work deliverables outside the purview of the EAC.

b) Not confirmed.

In the absence of EAC minutes or documentation to support the rationale for any changes subsequent to the 2015 audit process, Union cannot confirm the accuracy of this statement. Through email exchange with EAC members on June 22-23, 2017 OEB Counsel explained that OEB Staff were within their right to review draft deliverables in advance of, and without revealing their comments to, the EAC.

c) The current EAC Terms of Reference prepared by OEB Staff states that, *"Any materials that are circulated by the EC for comment will be delivered to OEB staff and EAC members at the same time."*[1]

[1] EB-2017-0323, SEC Interrogatory Submission, Schedule 1, p. 5

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 23

Preamble: Union Gas states: Union recommends that an EAC Charter reinstate a provision similar to the 2012-2014 auditor selection process that provides for more transparent and collaborative vendor selection among members of the EAC, and enables all parties to view the proposals and understand the scope of work and budget implications associated with the selection process. This will help ensure stakeholders are engaged and support the audit early in the process, and can lead to more constructive EAC activities and a more efficient EM&V process.

Question:

a) Please confirm that Union received the OEB's DSM EAC Terms of Reference, a draft of which was shared with EAC members on December 5, 2017.
b) Related to the Terms of Reference, please confirm that Union Gas participated in a discussion with OEB staff and EAC members on December 6, 2017.
c) Please confirm that, after a request by a Union Gas representative, OEB staff provided further opportunity to comment on the Terms of Reference in February 2018.
d) Please indicate whether Union Gas provided input to OEB staff on the Terms of reference during b) and c).

Response:

a) Confirmed.

b) Confirmed.

c) Confirmed.

d) Confirmed.

Union is pleased that OEB Staff have acknowledged its requests to pursue developing an EAC Terms of Reference ("ToR") and appreciates the opportunity to act within its defined advisory role to provide input into its development. For clarity, Union refers to the EAC ToR as the EAC Charter throughout its application. Further, Union believes the final version of the ToR should also be expanded as described in Union's response at Exhibit B.SEC.20.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 28

Preamble: Union Gas states: To begin to address the challenges experienced during the 2015 EM&V process, Union recommends that going forward the EAC be allowed to provide an advisory role to ensure timelines are kept on track and to help keep the entire process transparent in order to inform the utilities and its customers.

Question:

a) Please confirm that Union is aware of the consolidated schedule that the EC developed to provide EAC members information on timelines as it relates to data requests made to the utilities, and deadlines for EAC members to provide deadlines to comments on EC work products.
    a. Please file a screenshot of the schedule.
b) Please provide the comment matrices developed by the EC and shared with all members of the EAC in order to track all feedback provided by EAC members on DNV GL's 2015 NTG/CPSV study. Further, please provide the comment matrices developed by the EC and shared with all members of the EAC on the EC's 2015 annual verification report.
c) Union Gas states that the EAC should provide an "advisory role" in the future. Please clarify how this role differs from the role currently played by the EAC.

Response:

a) Confirmed.

Union is aware of the consolidated schedule that OEB Staff is referencing. An example of a schedule for 2016 audit activities can be found in Attachment A. A consolidated schedule in this format was first provided to the EAC in January 2018 for use in the 2016 audit and is an improvement over the schedule that was provided in relation to the 2015 audit. An example of a schedule used during the 2015 audit is provided in Attachment B.

b) Union prefers not to produce the comment matrices tracking feedback from EAC members without an order of the OEB. These contain comments on the drafts of DNV GL's 2015 NTG/CPSV Study and on the EC's 2015 Annual Verification report made by various members of the EAC. Out of respect for the confidentiality of these comments, Union prefers not to produce them without first obtaining the appropriate direction from the OEB. This position is consistent with that communicated by OEB Counsel, who advised that producing such comments would require an order from an OEB panel. If the OEB orders them to be produced, Union will produce them by updating its response to this interrogatory.

c) To clarify, Union's comments in the 2015 DSM Deferral application reflect the 2015 EAC and EM&V process. Union acknowledges that to date the 2016 EM&V process has afforded the EAC to play an advisory role more consistent with the role defined by the OEB.

Week #	1	2	3	4	5	6	7	8	9
Monday Date (M T W Th F)	1-Jan, 2-Jan, 3-Jan, 4-Jan, 5-Jan	8-Jan, 9-Jan, 10-Jan, 11-Jan, 12-Jan	15-Jan, 16-Jan, 17-Jan, 18-Jan, 19-Jan	22-Jan, 23-Jan, 24-Jan, 25-Jan, 26-Jan	29-Jan, 30-Jan, 31-Jan, 1-Feb, 2-Feb	5-Feb, 6-Feb, 7-Feb, 8-Feb, 9-Feb	12-Feb, 13-Feb, 14-Feb, 15-Feb, 16-Feb	19-Feb, 20-Feb, 21-Feb, 22-Feb, 23-Feb	26-Feb, 27-Feb, 28-Feb, 01-Mar, 02-Mar

Week #	10	11	12	13	14	15	16	17
Monday Date (M T W Th F)	05-Mar, 06-Mar, 07-Mar, 08-Mar, 09-Mar	12-Mar, 13-Mar, 14-Mar, 15-Mar, 16-Mar	19-Mar, 20-Mar, 21-Mar, 22-Mar, 23-Mar	26-Mar, 27-Mar, 28-Mar, 29-Mar, 30-Mar	02-Apr, 03-Apr, 04-Apr, 05-Apr, 06-Apr	09-Apr, 10-Apr, 11-Apr, 12-Apr, 13-Apr	16-Apr, 17-Apr, 18-Apr, 19-Apr, 20-Apr	23-Apr, 24-Apr, 25-Apr

Annual Verification

(E: designates Enbridge)
(U: designates Union)

- DSMSI, LRAM calcs 19
- E: CEM 26
- U: SEM 26
- U: Run Smart 26
- '15 AV Rpt Structure 26
- E: CSBD 9
- U: Opt Home 9
- E: School's EC 9
- E: LI NC 9
- Terms of Reference 23
- E: RSBD 16
- E: C&I Prescriptive 16
- U: C&I Prescriptive 16
- E: C&I DI 23
- E: Res Adstat 23
- U: Furnace EOL 23
- E: LI MF 2
- U: LI MF SA 2
- U: LI MF MR 2
- E: Home Energy Conservation 16
- E: Low Income Part 9 16
- U: Home Reno Rebate 16
- U: Home Weatherization 16
- E: RunitRight 23
- E: Energy Lead's 23
- Possible interim AV report w/out CP
- Ad Hoc Minor Documentation Requests / Requests for Clarification

CPSV

- Onsite Postal Codes 12
- Bin 1 12
- Advance letter 12
- Alt reporting thresholds 15
- Project doc checklist 12
- Site report template 19
- Bin 2 19
- EUL/RUL sequence 19
- Bin 1 Doc Checklist
- Bins 3 and 4 26
- Bin 2 Doc Checklist
- Prog Orient Mtgs 5
- Bins 3/4 Doc Checklist
- Ongoing final documentation delivery within 2 days after completed TSER or site visit
- Utility or EAC on site visits
- First Site Reports 16
- Second Site Reports 30
- Third Site Reports 13
- Fourth Site Reports
- Union deliver new savings estimates for the population of measures with influence correction factors

Custom Spillover

- Enbridge CCM or ML in 2013/14 data 11
- Draft Custom Spillover Memo 9
- 28

Measure Life

- Draft Work Plan 26
- 9
- Data Request 9
- Draft measure selection 23
- Prep for Applying ML 19
- 9
- Draft report 13

C&I Prescriptive Verification

TRM

- Deliver proposed update requests to EC

EAC agenda

(see above for legend)

Week	EAC agenda
1	
2	Consol.schedule; Code of Conduct; Info EC can share at cust level; Plan to discuss M&V 2.0; Update Schedule/Action Items
3	No Meeting
4	DSMSI, LRAM calcs; Alt reporting thresholds; RUL for retrofit add-ons; EUL/RUL sequence; CPSV site report template; Update Schedule/Action Items
5	E: CEM; U: SEM; U: Run Smart; ML work plan; Update Schedule/Action Items
6	Tech policy issue: App B; '15 Rpt Structure; Comment Matrices; Terms of Ref Update; Update Schedule/Action Items
7	E: School's EC; U: Opt Home; E: LI NC; E: CSBD; Update Schedule/Action Items
8	E: C&I Prescriptive; U: C&I Prescriptive; Custom Spillover Memo; Definition of "Program"; Applying ML; E: RSBD; Update Schedule/Action Items
9	E: C&I DI; E: Res Adstat; U: Furnace EOL; ML measure selection; Update Schedule/Action Items
10	E: LI MF; U: LI MF SA; U: LI MF MR; Update Schedule/Action Items
11	CPSV live calcs; Update Schedule/Action Items
12	CPSV site reports; E: Home Energy Conservatio; E: Low Income Part 9; U: Home Reno Rebate; U: Home Weatherization; Update Schedule/Action Items
13	CPSV live calcs; E: RunitRight; E: Energy Leaders; Update Schedule/Action Items
14	CPSV site reports; Update Schedule/Action Items
15	CPSV live calcs; Update Schedule/Action Items
16	CPSV site reports; Draft ML report; Update Schedule/Action Items
17	CPSV live c; Updat; Schedule/Acti

EAC review and provide comments
#: deadline for comments due
Utility deliverable period
#: deadline for deliverable
Final Report Delivered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18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
PSV
Draft Report 3
22
Draft Report 13
1
Fifth Site Reports 11
27
Final Site Reports 25
25
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27
TRM Update Workplan 8
Draft updated TRM measures 24
calcs
CPSV site reports
TRM measure list
CPSV live calcs
CPSV site reports
CPSV live calcs
CPSV site reports
TRM Workplan
Draft CPSV Results
Draft AV Results
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Schedule

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			Updated TRM	28													
RM measures Jpdate :/Action Items					Updated TRM Update Schedule/Action Items												

Task	Oct	November				December					January				February				March				
	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31
Bin 1 (Census)	S (28)			Due	Rev	Due																	
Bin 2 (CPSV Sample)			S (8)		Due	Rev	Due																
Bin 3 (FR Sample/Backup)			S (8)			Due	Rev	Due															
Bin 4 SO CATI (Sample and Backup)			S (8)								Due												
FR IDI Review			S (8)	Due	Final																		
Final SOW				Final																			
ESC/AM Interviews Round 1				R (15)		Call																	
Advance Letters			R (9)		Final	Send																	
ESC/AM Interviews Round 2						R (30)	Call																
FR IDIs in Field																							
Onsite Scheduling																							
Onsites in Field																							
Vendor IDIs in Field																							
SO CATI in Field																							
SO Project Files															R		Due						
All Program 2015 Tracking data				R		Due																	
All Program Tracking data for 2013-16 that SO customers are eligible for							R					Due											
SO Follow Up IDIs																							

S	Send
R	Request
Rev	Review

DNV GL
Utilities
Together

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 29

Preamble: Union Gas states: Union recommends that a formal Charter or Terms of Reference be established for the EAC and OEB Staff, with clear objectives, conflict resolution processes, and accountabilities for OEB Staff's role as coordinator, along with the expected advisory functions of the utilities and other members of the EAC. This Charter should be developed in collaboration with the EAC, and include consideration of the following components:

- Consensus as an overarching objective;
- Definition of OEB Staff's role as coordinator;
- Guidance on how differences of opinions will be resolved when consensus is not achievable;
- Clarity on the EAC's role in guiding the EM&V process;
- Reintroduction of a provision similar to the 2012-2014 auditor selection process that makes vendor selection more transparent and collaborative among members of the EAC;
- Definition of OEB Staff and utility accountabilities related to budget and invoice management;
- Greater transparency between OEB Staff, EC and the EAC on evaluation budgets and costs;
- A process to manage delays for EM&V work;
- Consistent with the principle of transparency, all communication should be shared with all EAC members, excluding anything with specific customer information; and,
- A requirement for official meeting minutes prepared by an independent scribe for EAC meetings held both in-person and via teleconference. Minutes should be publicly posted quarterly on the OEB website similar to TEC meeting minutes.

Question:

a) Please confirm that Union Gas had an Audit Committee that undertook the annual evaluation of DSM results in 2012 to 2014, which included utility representatives and intervenor members.
   i. Please indicate if an independent scribe was included in the Audit Committee.
b) Please confirm whether, when Union conducted its own audit of 2014 results under the previous DSM framework, whether its Audit Committee kept minutes and action items that were circulated to the Audit Committee for approval after each meeting and posted online.
   i. If so, please provide a sample of those approved minutes and action items.

ii. Please provide samples of other documentation, such as comment matrices, that the Audit Committee developed to ensure all committee members' comments were addressed.

Response:

a) Confirmed.

Union had an Audit Committee in 2012, 2013 and 2014 that oversaw the management of the 2012, 2013, and 2014 audits and included a representative from each of Union and three intervenors.

i. Union recommends that OEB Staff should be the independent scribe as the coordinator of the current process as further detailed in Union's application at Exhibit A, Tab 2, Appendix A, p. 4. However, as required, Union is willing to support OEB Staff with this responsibility.

In the 2012-2014 DSM Framework, there were two separate and distinct consultation processes to oversee evaluation related activities that Union participated in: i) the Audit Committee, responsible for managing the annual audit of Union's DSM portfolio to be filed annually with the OEB, including supporting EM&V activities; and, ii) the Technical Evaluation Committee, whose mandate was to prioritize and manage evaluation activities outside the annual audit process.

It is inappropriate to compare the Audit Committees to the current EAC in that the Audit Committees did not operate jointly, their membership was limited, and they only dealt with the annual DSM verification and audit process. However, the Audit Committees did have Terms of References in place to guide their mandates, to define the scope of activities they undertook, and to provide clarity of membership roles and responsibilities.

The TEC is a more comparable process to the current EAC because it was a joint utility process covering a more extensive array of evaluation activities and had a broader membership. In light of its uniqueness compared to the Audit Committees, the TEC recognized the need to take minutes and track discussions. This responsibility was shared by the utilities who disseminate draft minutes to committee members for endorsement before they were finalized. Having committee endorsement for the minutes ensured the minutes were unbiased and represented an independent perspective. Based on the endorsed minutes, quarterly reports were authored to outline committee activities and were posted on the OEB's website.

While the Audit Committees did not maintain formal and endorsed minutes, it is worth noting that Union did track discussions, agreements, comments and action items for the audit process, which were shared regularly with the auditor and the Audit Committee to help guide the process. These notes ensured the auditor addressed individual committee member concerns and supported the consensus objective of the Audit Committee. The Audit Committee also released an annual Audit Committee DSM Audit Summary Report which demonstrated the collaborative and consensus-based nature of the process. The DSM Audit Committee Audit Summary Reports were filed with the Board as part of Union's previous DSM deferral applications.

b) As noted in the response to part a) above, Union confirms that as part of its responsibility to coordinate the 2014 audit process it captured: action items, agreements, questions, comments and positions submitted by Audit Committee members and the auditor in writing and verbally during Audit Committee calls.

This information was stored in a spreadsheet that was distributed to Audit Committee members and the auditor following Audit Committee calls as a means of helping ensure all items were addressed. However, it was never formally approved by all members of the Audit Committee. As such, Union is not in a position to presume that the content it transcribed was endorsed by the Audit Committee. To avoid misrepresenting Audit Committee member positions and absent their consent, Union declines to produce this spreadsheet.

Union confirms that as part of Union and EGD's joint responsibility to coordinate TEC meetings, the utilities maintained meeting minutes that were distributed for TEC approval following TEC meetings. Unlike the Audit Committee spreadsheet, TEC minutes were officially endorsed, however, they were not intended to be made public. The TEC reached agreement that *"When consensus is reached, members can disclose information about their own negotiating positions but not the negotiating positions of other members"*.[1]

The utilities also jointly prepared publically available TEC quarterly reports endorsed by TEC members. Please see response at Exhibit B.Staff.5 a) ii) for the 2014 TEC quarterly reports.

[1] Ontario Natural Gas Technical Evaluation Committee 2014 4th Quarter Report, Section 6
https://www.oeb.ca/documents/TEC/Quarterly%20TEC%20Reports/TEC%202014%20Q4%20Report.pdf

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 34

Preamble: Union Gas states: Union is concerned that the EC will continue with this approach during the 2016 EM&V process, negatively impacting Union's customer relationships, causing delays similar to those in 2015, and adding an unnecessary cost to customers. In the interest of continuous improvement, Union urges the OEB to direct the EC to abandon the oversampling approach and return to the sampling methodology that was developed for, and that gained the consensus of, the TEC.

Question:

a) Please indicate how many customer complaints were received on the extensive duration of the site visits.
   a. Please provide redacted verbatim responses from those customers.
b) Please indicate how many customer complaints were received on CPSV site visits in 2012, 2013, and 2014.
c) Please confirm that the EC reduced sampling levels in 2016 response to comments from EAC members, as noted in the 2016 CPSV Scope of Work.

Response:

a) Customer complaints were received from approximately 6% of the customers that underwent CPSV on-site verification. Customer complaints about 2015 CPSV activities were predominantly relayed to account managers over the phone or in person. Three complaint emails that originated from customers were forwarded to the DSM evaluation team (please see Attachment A).

b) Union has no record of any customer complaints relating to 2012, 2013 or 2014 CPSV site visits.

c) Union confirms that the EC reduced the sampling levels from 75 in 2015 to 62 in 2016. It is worth noting that while the original Scope of Work for 2015 CPSV envisioned verification of 75 sample projects for Union, 192 projects were actually verified, which is 2.6 times greater than the original Scope of Work. If this same factor is applied to the 2016 sampling level then Union could expect that 159 projects could be actually verified in 2016, which would remain excessive and cause a burden on customers. Despite this, Union is optimistic that the number of 2016 projects actually verified will not exceed the sampling level of 62 and thus customers will not be subjected to continued oversampling burden.

From: [redacted]
Sent: March 21, 2017 12:56 PM
To: [redacted]
Subject: Verification and Evaluation of Union Gas Energy Efficiency Program - DVN GL

[redacted]

I received an email from generic e-mail box at Union on January 25th to be part of phone survey – your name listed as contact so I am approaching you. [redacted] also asked as follow-up when he was in on his last call to us in February.

I was contacted last week via e-mail by DNV GL – twice in 48 hours, some 7 weeks after initial contact, quite honestly with a tone/edge that was not well received by myself as my response would suggest.

I am not sure if this process is one Union is choosing to do, or it has been mandated through the regulator frame work under which you operate. I am not sure if DNV GL was Union's choice or imposed. I am not sure if my negative interaction is the exception in dealing with this "well regarded" organization. I share in the event this is not unique.

I DO NOT consider this a reflection on anyone from Union – after many years of working with many Union folks on issues ranging from business through the subject efficiency programs, I say with confidence that this is not how you guys roll. My phone interview is scheduled for later this week in support of Union's efforts.

No reply needed.

[redacted]

From: [redacted]
Sent: January-25-17 9:34 AM
To: [redacted]
Subject: FW: Verification and Evaluation of Union Gas Energy Efficiency Program - Scheduling
Importance: High

[redacted], are you co-ordinating this with STANTEC? I am not completely comfortable with them coming onsite with short notice without your representation. [redacted] would be leading the on-site visit to the Boiler house and is unavailable until after Feb 1.

[redacted]

From: [redacted]
Sent: January-23-17 3:53 PM
To: [redacted]
Cc: [redacted]
Subject: RE: Union Gas Energy Saving Project Verification

[redacted]

Our participation is still pending. It doesn't refer only to a few questions, but a much more in-depth data collection request and walkthroughs.

If they look for that for all of the projects you have enclosed, then I'm afraid we'll likely won't be participating. Stantec's contact said she'll get back to me with the plan for the day and clarifying the scope. Once we have that info, we'll make our decision.

Thanks for letting us know which projects they are referring to, because Stantec had been unable to tell us.

Kind Regards,

[redacted]

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 35

Preamble: Union Gas states: In a number of instances, the EC did not provide the EAC with documentation, calculations or other detail sufficient to reproduce its EM&V findings. Despite requests from members of the EAC for more transparency, the EC provided insufficient information to reproduce EM&V findings. This lack of supporting information limits a critical review of EM&V findings, requires the EAC to rely upon an assumption that the EC "did it right", and reduces the ability of the EAC to provide effective input and advice into the EM&V process. In areas for which Union was able to verify the EC's calculations, errors were found.

Question:

a) Please specify the findings/results of the EC Union was attempting to replicate. Indicate if they related to energy impacts, cost effectiveness, etc.
b) Please detail all data requests made by Union to the EC throughout the evaluation process. Please specify which of these requests were fulfilled and which, in the opinion of Union, were not satisfactorily addressed.
c) The EC was not able to provide requested data to Union given its confidential nature. Specifically, the data could not be provided in a manner that would protect the anonymity of survey respondents. On page 8 of Navigant's report found at Exhibit A, Tab 2, Appendix E, as it relates to NTG data, experts note that "contractors will not release information if used to identify specific customers." Why does Union believe the EC should have overlooked its commitment to respondents to protect their confidential data which is contrary to best-practice?
d) Please confirm that all errors identified by Union were corrected by the EC and the final 2015 evaluation report.
e) Please indicate during what process Union Gas identified the errors. E.g., did Union Gas identify the errors during the EAC review process the EC facilitated in order to gain stakeholder feedback on preliminary findings?

Response:

a) The findings/results of the EC that Union was attempting to replicate are summarized below.

- Derivation of CPSV sample strata and weighting;

- Calculations of the EC's verification findings for the 124 of 192 verified projects that the EC adjusted through CPSV; and,

- Calculations of CPSV adjustment factors (realization rates) applied to Union's custom program results.

These findings impact energy savings, shareholder incentive calculations and cost effectiveness for CI, Low-Income and Large Volume custom programs in the Resource Acquisition, Low-Income and Large Volume scorecards respectively. LRAM amounts are also impacted.

b) One of Union's principal concerns during the 2015 EM&V process was reproducing the EC's results. This was critical to Union for three principle reasons: i) it holds the EC accountable to its findings; ii) it ensures that any adjustments made to the data being audited are consistent with the methodology, assumptions, and approach that the EC has reported to have taken; and, iii) having reproducible audit results adds to the level of transparency needed to facilitate a critical review of audit conclusions and helps identify possible material errors.

Over the course of the 2015 EM&V process, Union requested the EC provide additional data in instances where Union was unable to reproduce its results. Written requests for such data are summarized in Table 1 below. Union excluded duplicate/multiple requests for identical data.

Table 1

Data Requested	Date Requested	Date Provided	Responsive?
Union does not appear to have a data set for every project in the CPSV sample that aligns with the domains as listed **[in EC's draft CPSV/NTG results report]**. This would be helpful to track and understand the results presented in this table and throughout the report.	Jun 14, 2017 *Requested as part of comments on the EC's draft CPSV/NTG results report.*	Aug 16, 2017	No. Although the EC provided a mapping, data was hard coded and did not enable Union to track and understand the results presented in this table and throughout the report.
Can DNV GL please provide the targeted N values for each domain in addition to the completed n values? How were targeted N	Jun 14, 2017 *Requested as part of comments on the EC's draft CPSV/NTG results report.*	Aug 16, 2017	No. The EC's reply referred only to hardcoded data that could not be reproduced and a qualitative discussion of the sampling process.

Data Requested	Date Requested	Date Provided	Responsive?
values calculated? Can DNV GL please share the inputs, assumptions and active calculations that produced them?			
Union understands that DNV uses specialized software to calculate the statistics presented **[in EC's draft CPSV/NTG results report]**. Union would like to request either active calculations that produced these values or a walkthrough of the software to see how these values were calculated.	Jun 14, 2017 *Requested as part of comments on the EC's draft CPSV/NTG results report.*	Aug 16, 2017	No. The EC's reply listed variables used in the software without meaningful description and did not provide active calculations.
Union has requested the sample of projects being used as the basis for the CPSV to help correlate study results with the impact of the utility incentive accurately. It is rare but in the past, Union has also identified errors in these calculations. Union would like to request: -Identification of which projects were included in the sample and which were given a weighting of 1 - Definition of size strata (m^3 ranges for each strata and how they were determined) - Any other factors, inputs and assumptions used in RR calculations	Jun 14, 2017 *Requested as part of comments on the EC's draft CPSV/NTG results report.*	Aug 16, 2017	No. The EC provided elements of Union's data request as part of a data spreadsheet. However, the spreadsheet did not provide active calculations that connect the CPSV findings as presented to the EAC to the calculations of adjustment factors (realization rates) applied to Union's custom program results. Despite best efforts, Union was unable to make this connection using data provided by the EC.

Data Requested	Date Requested	Date Provided	Responsive?
- Active calculations that connect the CPSV findings as presented to the EAC to the domain-specific **[realization rates]** presented in **[the EC's draft CPSV/NTG results report]**.			
Appendix K **[of the EC's CPSV/NTG draft report]** provides a good discussion of the approach taken but seeing at least a few examples of how a Free Rider rate is calculated from **[a surveyed customer's]** timing, quantity and efficiency responses would be very helpful. Can DNV GL provide examples that show active calculations that connect qualitative answers to a Free Rider value?	Jun 14, 2017 *Requested as part of comments on the EC's draft CPSV/NTG results report.*	Aug 16, 2017	Partially. The EC did provide examples in person at EAC meeting and added a few to their final CPSV/NTG report but these did not include active calculations.
Union would like to request the inputs, assumptions and scoring that leads from the **[sampled customer Free Rider survey]** responses provided in Appendix C to the quantitative **[Free Rider]** rate calculated per project. Although there are confidentiality concerns, could this information not be provided without an associated project ID or gas savings value?	Jun 14, 2017 *Requested as part of comments on the EC's draft CPSV/NTG results report.*	Aug 16, 2017	No. The EC's reply made reference only to conceptual and methodologic descriptions. It did not include Union-specific data or examples on how qualitative customer Free Rider survey responses translate into quantitative Free Rider rates.

Data Requested	Date Requested	Date Provided	Responsive?
Can DNV GL please provide the weighting, calculations, inputs and assumptions that connect the qualitative Secondary Attribution responses to the **[Free Rider]** ratios presented **[in the EC's draft CPSV/NTG results report]**? If there are concerns on confidentiality, perhaps some examples can be provided.	Jun 14, 2017 *Requested as part of comments on the EC's draft CPSV/NTG results report.*	Aug 16, 2017	No. The EC's reply made reference to conceptual methodology only.
Can DNV GL please provide the weighting, calculations, inputs and assumptions that connect the qualitative vendor responses to the **[Free Rider]** ratios presented **[in the EC's draft CPSV/NTG results report]**? If there are concerns on confidentiality, perhaps some examples can be provided.	Jun 14, 2017 *Requested as part of comments on the EC's draft CPSV/NTG results report.*	Aug 16, 2017	No. The EC's reply made reference to conceptual methodology only.
Please provide full calculations used to determine the verified LRAM amount.	Aug 9, 2017 *Requested as part of comments provided on the EC's draft verification report.*	Sep 11, 2017	No. Despite not being provided with full calculations, Union was able to calculate its own version of verified LRAM amounts, which differed from the EC's findings. The EC adopted Union's version as the correct verified LRAM amount.
Although the impact of **[Home Reno Rebate Realization Rates]** is minor, Union is unable to	Aug 9, 2017 *Requested as part of comments provided on the*	Sep 11, 2017	Yes. The EC provided Union with sufficient data to recreate the Home Reno Rebate

Data Requested	Date Requested	Date Provided	Responsive?
reproduce them. Can their calculation be provided?	*EC's draft verification report.*		realization rates.
Union is unable to reproduce **[Home Weatherization Program]** realization rates. Can their calculation be provided?	Aug 9, 2017 *Requested as part of comments provided on the EC's draft verification report.*	Sep 11, 2017	Yes. The EC provided Union with sufficient data to recreate the Home Weatherization realization rates.
Can **[the EC's TRC]** model be provided to the EAC?	Aug 9, 2017 *Requested as part of comments provided on the EC's draft verification report.*	Sep 11, 2017	Partially. The EC's TRC model was provided with draft findings but the model was never updated with final verification findings.

In addition to these written comments, during EAC calls where verification results were discussed, Union verbally requested the EC's calculations of project-specific verification results for the 124 of 192 verified custom projects that were adjusted through the CPSV process. The EC did not provide any such calculations and thus did not fulfill Union's data request.

c) Union's commitment to maintaining customer confidentiality is absolute, where appropriate. Union disagrees that the EC would have had to breach its commitment to protecting respondents' confidential data in order to provide the data requested. The notion of confidentiality referred to in the Navigant study by OEB Staff is in relation to NTG survey responses, not the derivation of the EC's CPSV findings, which are not subject to utility/customer confidentiality. As per Union's response at part a) above, the data that Union was attempting to replicate related to CPSV and not NTG. As per Union's response at part b) above, in the few instances where Union requested data related to NTG responses, Union suggested that sample calculations be provided or that the data be sufficiently redacted to protect customer confidentiality.

d) Confirmed.

All errors identified by Union were corrected by the EC in the final 2015 verification report. However, because Union was not provided sufficient data to replicate and check the accuracy of the EC's findings it cannot confirm whether or not other errors persist.

e) The errors Union identified were related to the EC's calculation of Union's LRAM claim. Union first identified an error in the LRAM calculation in August 2017 while the EC was

updating its draft verification report within the comment period provided to the EAC. Following a release of a then-final EC verification report on September 11, 2017, for which there was no comment period, Union noted that the LRAM value was still incorrect. The EC re-released a corrected final report on September 18, 2017. The EC then released another final report on December 12, 2017 after addressing an additional error to realization rates.

Union notes that it endeavours to provide comments within allocated comment periods. However, in the event Union identifies a material error beyond the designated comment period, it will inform the EC of such an error as soon as possible.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Energy Board Staff ("Staff")

Reference: Exhibit A, Tab 2, p. 37
Exhibit A, Tab 2, Appendix E

Preamble: Union Gas states: Given the information contained in the Navigant Study, it is apparent that the EC's NTG Study did not meet best practice standards.

And

Navigant identifies that the following steps can be taken in order to mitigate the issues surrounding self-report studies:

- Fast Feedback
- Sensitivity Analysis
- Triangulation
- Other Best Practice

Question:

a) Please specify where in Navigant's report that Navigant states the NTG study completed by DNV did not leverage a best-practice approach and should therefore not be considered as a reasonable proxy for the influence of Union's programs.
b) Please confirm that Union communicated to the EAC that the participant data required to facilitate the self-report method cannot be made available by the utilities earlier than mid-March of the subsequent year. E.g., 2017 participant data cannot be provided until, at the earliest, mid-March 2018 which equates to a 15-month delay for projects undertaken in January 2017.
c) Please confirm that, due to these delays, it is not possible to complete the self-report method within the 3-month period following participation as recommended by Navigant.
d) Specifically for custom project NTG ratios; please indicate the extent to which the three jurisdictions discussed in Navigant's report (California, Illinois and Massachusetts) utilize all of the four steps identified above in order to mitigate the issues of self-report studies.

Response:

a) The Navigant NTG jurisdictionally study was not intended to analyze the work undertaken by DNV GL. Rather, it was intended to explore NTG policies and best practices identified by experts, which included mitigating the known concerns with the reliability of self-report survey methods as follows:
    i. Fast Feedback

ii. Sensitivity Analysis
iii. Triangulation
iv. Other Best Practice

These practices were not included in the 2015 NTG study undertaken by DNV GL

b) Not confirmed.

Union has provided participants tracked for DSM programs within a program year from which to draw a sample and initiate verification work.

c) Not confirmed.

Provided the sample design considers a staged approach, it is possible to complete the self-report method within the 3-month period following participation as recommended by Navigant.

d) As noted in the Navigant Study,[1] the three jurisdictions reviewed (California, Illinois, and Massachusetts) use the best practices summarized below to mitigate against self-reported survey concerns.

California:

- **Fast Feedback –** CPUC staff pre-screen custom projects for NTG prior to project approval for some utilities.
- **Sensitivity analysis –** required.
- **Triangulation –** used by including project vendors.
- **Other best practices –** used by including multiple scores for questions to account for different ways of measuring program influence.

Illinois:

- **Fast Feedback** – increasingly being used by having NTG studies conducted in waves throughout the year.
- **Sensitivity analysis** – required.
- **Triangulation** – used by including project vendors.
- **Other best practices** –used by including professional interviewers to understand the project story (follow-ups to avoid non-response bias and making sure question wording is good).

[1] Exhibit A, Tab 2, Appendix E

Massachusetts:

- **Sensitivity analysis** – used when NTG methods were developed.
- **Triangulation** – used by including project related trade allies.
- **Other best practices** – used by including time-series check-in's to support program adjustments to improve NTG in addition to how the questions are stylized.

UNION GAS LIMITED

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

Reference:

1. Exhibit A, Tab 2, p. 1
2. Exhibit A, Tab 1, p. 5

Preamble:

1. Union's three primary concerns with the OEB Staff-coordinated 2015 DSM EM&V process and results are:
   - The retroactive application of the results of the Evaluation Contractor's (EC) incomplete and ongoing commercial and industrial Custom Project NTG study ("NTG Study") to Union's 2015 DSM program results;
   - The lack of efficiency, collaboration, transparency, stability and predictability in the coordination of the 2015 EM&V process; and,
   - EC work deliverables deviated from the Scope of Work, led to delays, and contributed to customer complaints.
2. The approximate one-year delay of the EM&V results is excessive and is in part due to the prolonged time taken to finalize the EM&V Plan, and excessive project sampling relative to prior audits for the 2015 Custom Project Savings Verification ("CPSV") Process. As a result of this lack of EM&V process efficiency, Union's customers will bear the burden of disposition of 2015 deferral balances no sooner than in 2018.

Question: Please confirm Union Gas's understanding of that when the latest DSM guidelines called for 2015 to be a transition year, "all" of the elements included in the term "program parameters" including the use of the previous audits to establish targets as the basis for review of performance of the 2015 program year were included.

Response:

Confirmed.

It is Union's understanding that when the 2015-2020 DSM Framework called for 2015 to be a transition year, all programs, as well as parameters defined by the 2015-2020 DSM Framework as "*budget, targets, incentive structure*" were included.[1]

[1] EB-2014-0134, DSM Framework, p.37

UNION GAS LIMITED

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

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2. Exhibit A, Tab 1, p. 5

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   - The retroactive application of the results of the Evaluation Contractor's (EC) incomplete and ongoing commercial and industrial Custom Project NTG study ("NTG Study") to Union's 2015 DSM program results;
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Question: Please explain why the use of a proxy deemed spillover value from another jurisdiction and another study is not appropriate.

Response:

Union does not disagree in principle with the concept of a proxy deemed Spillover value from another jurisdiction. Union is concerned with OEB Staff's unilateral direction to the EC to include a proxy deemed Spillover value in its findings without prior notice or consultation with the EAC.

UNION GAS LIMITED

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

Reference:

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2. Exhibit A, Tab 1, p. 5

Preamble:

1. Union's three primary concerns with the OEB Staff-coordinated 2015 DSM EM&V process and results are:
   - The retroactive application of the results of the Evaluation Contractor's (EC) incomplete and ongoing commercial and industrial Custom Project NTG study ("NTG Study") to Union's 2015 DSM program results;
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2. The approximate one-year delay of the EM&V results is excessive and is in part due to the prolonged time taken to finalize the EM&V Plan, and excessive project sampling relative to prior audits for the 2015 Custom Project Savings Verification ("CPSV") Process. As a result of this lack of EM&V process efficiency, Union's customers will bear the burden of disposition of 2015 deferral balances no sooner than in 2018.

Question: Please explain the feature, "Secondary Attribution" and indicate the impact of the Evaluation Contractor not applying it to the 2015 results.

Response:

The term Secondary Attribution is explained in Union's application at Exhibit A, Tab 2 pp. 31-32. Further, a definition of Secondary Attribution is provided in Union's response at Exhibit B.SEC.5. The impact of not applying Secondary Attribution to Union's 2015 DSM program results as part of the EM&V process is explained in Union's response at Exhibit B.GEC.2.

UNION GAS LIMITED

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

Reference:

1. Exhibit A, Tab 2, p. 1
2. Exhibit A, Tab 1, p. 5

Preamble:

1. Union's three primary concerns with the OEB Staff-coordinated 2015 DSM EM&V process and results are:
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Question: Please outline how the evaluation deviates from best practices with reference to the designation of free riders.

Response:

As noted in the Navigant Study, use of self-report survey method in NTG studies is concerning.[1] DNV GL used the self-report method in the 2015 NTG Study.

Best practice strategies can be employed to mitigate issues with the self-report survey method and improve upon its accuracy as summarized below.

- Fast Feedback

- Sensitivity Analysis

[1] Exhibit A, Tab 2, Appendix E, pp. 5-6.

- Triangulation

- Other Best Practice

None of these best practices were used by DNV GL for the 2015 NTG Study. Of these practices, Union is most concerned by the likely impact that the delay in surveying customers to establish Free Ridership values had on the accuracy of the survey results. For a customer participating in the CI custom program in January 2015, an interview in February 2017 is more than two years after the project was complete.

UNION GAS LIMITED

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

Reference:

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2. Exhibit A, Tab 1, p. 5

Preamble:

1. Union's three primary concerns with the OEB Staff-coordinated 2015 DSM EM&V process and results are:
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Question: Please confirm that in previous evaluation processes, the company was able to replicate the calculations used by the EC and understand how participant responses were used in the scoring algorithm.

Response:

To clarify, Union confirms that in previous evaluation processes, it was able to replicate auditor findings on shareholder incentive, LRAM, and cost effectiveness calculations. Union was also able to understand how participant verification responses translated into audit findings and how those were used to calculate realization rates.

UNION GAS LIMITED

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

Reference:

1. Exhibit A, Tab 2, p. 1
2. Exhibit A, Tab 1, p. 5

Preamble:

1. Union's three primary concerns with the OEB Staff-coordinated 2015 DSM EM&V process and results are:
   - The retroactive application of the results of the Evaluation Contractor's (EC) incomplete and ongoing commercial and industrial Custom Project NTG study ("NTG Study") to Union's 2015 DSM program results;
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Question: Please confirm whether Union Gas was aware if the EAC members had received a copy of the May 23, 2017 email from Board Staff to the Evaluation Contractor with on the topic of the evaluation report.

Response:

Union is not aware of an email from OEB Staff to the EC dated May 23, 2017. However, OEB Staff did send an email to the utilities on that same day which Union interprets BOMA to be referring to. This email informed the utilities that OEB Staff had instructed the EC to apply the NTG results to the 2015 DSM program results.

UNION GAS LIMITED

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

Reference:

1. Exhibit A, Tab 2, p. 1
2. Exhibit A, Tab 1, p. 5

Preamble:

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Question: Please provide a typical schedule for annual reporting and evaluation when it was managed by the utilities.

Response:

Please see the response at Exhibit B.SEC.7.

UNION GAS LIMITED

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

Reference:

1. Exhibit A, Tab 2, p. 1
2. Exhibit A, Tab 1, p. 5

Preamble:

1. Union's three primary concerns with the OEB Staff-coordinated 2015 DSM EM&V process and results are:
   - The retroactive application of the results of the Evaluation Contractor's (EC) incomplete and ongoing commercial and industrial Custom Project NTG study ("NTG Study") to Union's 2015 DSM program results;
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Question: Please confirm that a key element of the 2011 Charter was the use of a consensus-based process to govern EM&V.

Response:

Confirmed.

Reaching consensus was a key objective of TEC and Audit Committee processes as outlined in the 2011 Stakeholder Terms of Reference.[1]

[1] EB-2011-0327 Settlement Agreement, Appendix B, Attachment A, Joint Terms of Reference on Stakeholder Engagement for DSM Activities by Enbridge Gas Distribution Inc. and Union Gas Limited, November 4, 2011, pp. 4 & 7

UNION GAS LIMITED

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

Reference:

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2. Exhibit A, Tab 1, p. 5

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Question: Please outline how Union Gas managed its evaluation budget when it managed the evaluation process. Please indicate the approved evaluation budgets and actual spending for the evaluations completed after the 2011 Terms of Reference were established until the completion of the 2014 evaluation. Please provide the current status of the costs of the 2015 evaluation and indicate how it compares to the OEB approved budget under the most recent DSM Framework.

Response:

Prior to the 2015 EM&V process Union managed contractor procurement and budget allocation, however, outside of the annual verification and audit process, evaluation activities were prioritized by the TEC. Within this construct, information was available to accurately forecast, accrue and track EM&V related costs. The previous processes: i) produced sufficient documentation to support financial reporting and the approval of invoice payments; ii) allowed for more informed RFP and contracting of vendors since details of the work being performed and the year over year cost of these activities were tracked; and, iii) supplied data required for future planning. Budgets proposed in Union's 2015-2020 DSM Plan relied on historical verification and auditor costs to project future spending requirements.

Since its EM&V budgets were developed to support evaluation activities in addition to audits, Union needs to know, in advance, the anticipated budget to be spent on EC and audit costs to effectively forecast the performance of programs, including use of DSMVA funding, while ensuring cost-effectiveness throughout the portfolio. There should also be transparency in the actual cost reporting and invoicing to allow integrity in financial reporting.

Actual spending and approved evaluation budgets are provided in Table 1 below.

Table 1

Fiscal Year	Evaluation Category	Actual Spend[1]	Budget
2012	Program	$338,307	$160,000
	Portfolio	$489,102	$969,088
	Total	**$827,409**	**$1,129,088**
2013	Program	$439,925	$168,244
	Portfolio	$464,788	$1,019,032
	Total	**$904,713**	**$1,187,276**
2014	Program	$629,162	$170,415
	Portfolio	$398,782	$1,032,178
	Total	**$1,027,944**	**$1,202,593**
2015	Program	$816,519	$173,278
	Portfolio	$525,012	$1,049,519
	Total	**$1,341,531**	**$1,222,797**

[1]The spending and budget amounts shown reflect all evaluation spending that occurred during the calendar year. This includes current program year activities as well as audit related expenses from previous program years (i.e. 2015 includes EM&V related to 2015 program year as well as the majority of audit expenses related to 2014 program year).

Costs relating to the 2015 OEB-coordinated evaluation occur over multiple fiscal years (i.e. 2015 to 2017), and continue into 2018 since activities are not fully closed. This makes a direct comparison to OEB approved budgets difficult. Listed below are all costs incurred or expected with regards to the 2015 evaluation process.

EC/CPSV Costs Related to 2015 Evaluation

- Costs invoiced: $ 324,637
- Costs accrued year-end 2017 (not yet invoiced): $ 162,522
- Total: $ 487,159

EC costs are based on OEB invoices and information provided by OEB Staff.

EAC Costs Related to the 2015 Evaluation Process

- Cost Awards Decisions (August 2015 to October 2017): $70,157

Additionally, OEB Staff coordinated the 2015 NTG Study. However, the costs for that study are paid directly to DNV GL since this contract remains with the utilities. Thus far, the NTG Study costs are as follows:

- Costs invoiced between 2015 to 2017: $ 164,500 USD
- Costs accrued year-end 2017 (not yet invoiced): $ 11,444 USD
- Remaining costs expected in 2018: $ 26,945 USD
- Total: $ 202,889 USD

Union is also expecting that there will be some costs resulting from additional work completed in 2018 related to finalizing the spillover component of the NTG Study but amounts for this are unknown.

For reference, the 2016, 2017 and 2018 OEB approved budgets are presented below in Table 2:

Table 2

Fiscal Year	Evaluation Category	Budget
2016	Program	$1,092,948
	Portfolio	$1,300,000
	Total	**$2,392,948**
2017	Program	$1,245,835
	Portfolio	$1,300,000
	Total	**$2,545,835**
2018	Program	$1,408,768
	Portfolio	$1,300,000
	Total	**$2,708,768**

UNION GAS LIMITED

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

Reference:

1. Exhibit A, Tab 2, p. 1
2. Exhibit A, Tab 1, p. 5

Preamble:

1. Union's three primary concerns with the OEB Staff-coordinated 2015 DSM EM&V process and results are:
   - The retroactive application of the results of the Evaluation Contractor's (EC) incomplete and ongoing commercial and industrial Custom Project NTG study ("NTG Study") to Union's 2015 DSM program results;
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Question: Please comment on Union Gas's understanding of how or if the contractors who delivered the survey were briefed with respect to the nature of Union Gas Programs. Did Union Gas understand if they were fully briefed on the multi-faceted nature of the Union Gas's Custom Programs which differ substantially from the prescriptive programs (which a generally composed of a higher efficiency product and an incentive with generic information about the use of such a product.)?

Response:

Union was not involved in briefing the contractors responsible for delivering the surveys and cannot comment on how or if they were briefed on the unique aspects of Union's custom programs. However, as per the EC's CPSV Scope of Work provided as Exhibit A, Tab 2, Appendix D, p. 33, the EC was to conduct interviews with Union's custom program account managers. These interviews were to focus on the specifics of program interactions with customers. The intent of the interviews was to ensure that the Free Rider survey design would cover the range of program activities that may have influenced decisions to implement projects. The EC never conducted these interviews.

UNION GAS LIMITED

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

Reference:

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Question: Union has proposed a Terms of Reference for the Evaluation Advisory Committee.
Would Union Gas be agreeable to the following roles and responsibilities of a committee chair to address some of the shortfalls of the current committee structure and operational processes?
Board or Committee Chair Responsibilities[1]: The chair's duties and responsibilities include, but are not limited to, the following:

- In consultation with the Executive Director, CEO or other board or committee members, schedule dates, times and location for meetings
- Ensure meeting are called and held in accordance with the organizations' mandate, terms of reference or by-laws
- In consultation with the Executive Director or CEO, and/or other board or committee members establish and confirm an agenda for each meeting
- Ensure the meeting agenda and relevant documents are circulated to the members of the committee 3-5 days in advance of the meeting
- Officiate and conduct meetings

[1] https://www.mycommittee.com/BestPractice/Committees/Chairingacommittee/ChairResponsibilities/tabid/264/Default.aspx

- Provide leadership & ensure committee members are aware of their obligations and that the committee complies with its responsibilities
- Ensure there is sufficient time during the meeting to fully discuss agenda items
- Ensure that discussion on agenda items is on topic, productive and professional
- Ensure minutes are complete and accurate, retained, included and reviewed at the next meeting
- Chair in camera meetings as required.

Response:

In principle, Union supports the BOMA submission as it pertains to OEB Staff's role relating to the EAC. Union has also provided additional items for consideration in relation to the EAC charter in its response at Exhibit B.SEC.20.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, pp. 6-7

Preamble: "In April 2016, the EC was selected, with no EAC or utility collaboration, to audit the utilities' respective 2015 portfolios of DSM programs. The 2015 EM&V process took 19 months to complete. This is approximately nine months longer than the duration of historical utility coordinated audits, despite the fact that historical processes were subjected to the scrutiny of consensus-based Audit Committees on all aspects of the audit, including selection of the auditor.

Question: Can Union provide a detailed timeline (from start to finish) of its previous DSM audits.

Response:

Please see the response at Exhibit B.SEC.7.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, pp. 6-7

Preamble: Union's application proposes basing 2015 results on 2014 assumptions.

Question: Is Union proposing to do the same for 2016 results, even though it's clear that the assumptions used for 2016 activities (2015 assumptions) are clearly out of date?

Response:

For reasons outlined in Union's application at Exhibit A, Tab 2, pp. 9-10, it is Union's position that the OEB has provided guidance that 2015 should be considered a roll-over or transition year from the 2012-2014 DSM Framework, and that a custom program NTG Study should be undertaken in 2016 to be applied to 2017.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, p. 27

Preamble: "These delays have also effectively created a new barrier to lowering Free Ridership as the utilities have not received actionable Free Ridership mitigation recommendations from the EC in a timely manner. One method by which Union can reduce Free Ridership within its custom offerings is by enhancing program design and implementation practices to include new Free Ridership mitigation efforts. One source of new Free Ridership mitigation efforts comes from feedback provided through the EM&V process. As part of this process, the EC and/or CPSV consultant provides an in-depth review of Union's custom offerings, integrates knowledge and expertise from other jurisdictions, and provides feedback that can be incorporated into program design."

Question:

a) Please provide any documents from 2015 and 2016 that detail Union's efforts to reduce free-ridership.
b) If no such documents exist, please explain why Union hasn't, on its own accord, attempted to mitigate to the greatest extent possible the problem of free ridership among its DSM programs.

Response:

a) & b)
Please see the response at Exhibit B.SEC.10.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, p. 31

Preamble: "During the 2015 EM&V process, Union provided extensive comments highlighting concerns it had with the approach and scope of the EC's proposed activities. In Union's opinion, many of these comments were not fully addressed and related issues were not resolved."

Question: Please provide these comments and any documents related to them.

Response:

The comments that Union provided regarding the approach and scope of the EC's proposed activities that were not fully addressed or resolved are summarized below. To the extent that those comments were provided in writing, they are set out verbatim. The comments were provided on draft EC reports and deliverables. Given that these materials were coordinated and managed by OEB Staff and were in draft form, Union is not in a position to produce them absent direction from the Board. Union has therefore reproduced its comments below.

Over-sampling:
The EC's decision to verify every project at a customer site for CPSV (referred to as over-sampling) caused undue burden to Union customers and increased time and resources needed to review findings for all parties involved. Further, Union requested the EC compare CPSV results with and without over-sampled projects to determine if the benefits of this approach outweighed the costs.

Union requested such a comparison as part of its comments provided on the EC's draft CPSV/NTG findings report. Union's comment was as follows:[1]

"The number of completed Units of Analysis are over double the target.

Union is concerned about the amount of benefit gained in comparison to the increase in customer burden caused by asking about every project at a site (regardless of if these projects are needed to meet the targeted sample size). These projects also require additional EAC review time and effort.

[1] Please see the response at Exhibit B.Staff.14.

If customers weren't asked about every project at a given site, by how much would this have impacted precision, accuracy and overall results for CPSV?"

The EC did not accommodate this request. Please also see the response at Exhibit B.EP.6.

The EAC was not provided with full documentation, calculations or other detail:
Union requested that sufficient detail be provided to reproduce audit findings. While Union is not in a position to share draft work products, this concern is exemplified by the EC providing four final verification reports, three of which were reissued to address corrections to the EC's findings. Union contends that had it been granted a more robust review of the auditor's adjustments, via access to review the auditor's live calculations, such errors could have been caught and confidence in the audit improved. Please see the response at Exhibit B.Staff.17.

Union's comments related to full documentation, calculations or other detail (that were not fully addressed or resolved) that were provided in the EC's draft CPSV/NTG findings report are summarized below:[2]

- Union does not appear to have a data set for every project in the CPSV sample that aligns with the domains as listed **[in EC's draft CPSV/NTG results report]**.
  This would be helpful to track and understand the results presented in this table and throughout the report.

- Can DNV consider rounding the RR to two decimal places and calculate verified savings to be **[for example]** exactly Claimed * 0.99?
  This would ensure consistent numbers between this report **[in Table 3]** and any updates to results.
  Union has the same request for NTG factors and net savings.

- DNV may want to consider providing a first-year gas realization rate.
  This RR has been provided in previous audits to adjust the first year annual gas savings for the CI Deep Savings Metric. It has also been used to adjust TRC values used for screening purposes.
  These calculations **[before application of a first-year gas realization rate]** can be found in the calculation tool provided **[by Union]** to DNV in January 2017.

- DNV may want to consider providing EUL realization rates. These RRs have been provided in previous audits to adjust TRC values used for screening purposes.

[2] Please see the response at Exhibit B.Staff.14.

Would the EUL RR be 99.8% for custom C&I?

- Can DNV please provide the targeted N values for each domain in addition to the completed n values **[for Tables 14, 16, 26, 28]**?
  How were targeted N values calculated? Can DNV please share the inputs, assumptions and active calculations that produced them?

- Union understands that DNV uses specialized software to calculate the statistics presented here **[in Table 14, 16, 26, 28]**.
  Union would like to request either active calculations that produced these values or a walkthrough of the software to see how these values were calculated.

- Union has requested the sample of projects being used as the basis for the CPSV to help correlate study results with the impact of the utility incentive accurately. It is rare but in the past, Union has also identified errors in these calculations. Union would like to request **[for Tables 14 and 26]**:
  - Identification of which projects were included in the sample and which were given a weighting of 1
  - Definition of size strata (m3 ranges for each strata and how they were determined)
  - Any other factors, inputs and assumptions used in RR calculations
  - Active calculations that connect the CPSV findings as presented to the EAC to the domain-specific ratios presented in this table.

- Appendix K **[of the EC's CPSV/NTG draft report]** provides a good discussion of the approach taken but seeing at least a few examples of how a Free Rider rate is calculated from **[a surveyed customer's]** timing, quantity and efficiency responses would be very helpful.
  Can DNV GL provide examples that show active calculations that connect qualitative answers to a Free Rider value?

- What does this size refer to? Can CCM ranges be provided for each **[in Table 55]**?

- Can verbatim responses to the battery of secondary attribution questions **[found in Table 100 and 101]** be provided in a similar fashion to Appendix C?

- Can DNV please provide the weighting, calculations, inputs and assumptions that connect the qualitative secondary attribution responses to the ratios presented here **[in Table 100 and 101]**?
  If there are concerns on confidentiality, perhaps some examples can be provided.

- Can verbatim responses to the battery of vendor questions **[found in Table 105 and 107]** be provided in a similar fashion to Appendix C?

- Can DNV please provide the weighting, calculations, inputs and assumptions that connect the qualitative vendor responses to the ratios presented here **[found in Table 105 and 107]**?
  If there are concerns on confidentiality, perhaps some examples can be provided.

- Sample expansion and ratio estimation **[in Appendix M]** would be made much more clear by providing active calculations of Union's CPSV weighting and ratio estimation

NTG Scope of Work was not adhered to:

- Union noted that despite the Scope of Work indicating that it would interview Union account managers to capture a more complete understanding of custom programs, these interviews were never conducted. This comment was provided verbally during an EAC call. There are no official EAC meeting minutes that capture this comment.
- Despite the Scope of Work indicating that Secondary Attribution would be quantified as part of the NTG value, the final report did not reflect this. See the response at Exhibit B.SEC.24 for verbatim comment that was not fully addressed or resolved.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, p. 32

Preamble: "As such, if Secondary Attribution is not measured, a program's Free Rider rate might increase, leading to incorrect and understated program results."

Question:

a) Please provide Union's Secondary Attribution estimates for 2014, 2015 and 2016.
b) Please provide any updates – and any documents associated with those updates that Union has made to its Secondary Attribution estimates since 2015.

Response:

a) The only estimates of Union's Secondary Attribution factors available are those provided by the EC in its final 2015 NTG Study Free Rider results. These estimates are 6% Secondary Attribution for Union's custom CI program and 4% Secondary Attribution for Union's custom Large Volume Direct Access program. In other words, excluding Secondary Attribution decreased the NTG rate from 45% to 39% for Union's custom CI program and from 12% to 8% for Union's custom Large Volume Direct Access program.

b) Union has no updates to these Secondary Attribution estimates.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, p. 33

Preamble: "The EC conducted CPSV on a quantity of projects that was more than double the target sample size proposed in its CPSV/NTG Scope of Work."

Question:

a) Can Union comment on whether the increased sample size would increase the accuracy of the study compared to previous studies.

Response:

It is Union's view that comparing the precision variance between the 2015 increased sample size and previous studies is not meaningful because they are dependent upon project populations. A more relevant comparison would be between 2015 verification results calculated using the increased over-sampling approach and using the actual sample, as was done in previous studies.

Union requested such a comparison as part of its comments provided on the EC's draft CPSV/NTG findings report. Union's comment was as follows:[1]

> *"The number of completed Units of Analysis are over double the target.*
>
> *Union is concerned about the amount of benefit gained in comparison to the increase in customer burden caused by asking about every project at a site (regardless of if these projects are needed to meet the targeted sample size). These projects also require additional EAC review time and effort.*
>
> *If customers weren't asked about every project at a given site, by how much would this have impacted precision, accuracy and overall results for CPSV?"*

The EC did not accommodate this request.

For information purposes, the precision values achieved for 2012-2015 CPSV are provided in Table 1 below.

[1] Please see the response at Exhibit B.Staff.14.

Table 1

Year	CI	Large Volume	Low-Income
2012	90/8.5	90/10	100% of population was sampled
2013	90/10.8	90/7.8 (T1) 90/6.9 (T2 and Rate 100)	90/7.7
2014	90/8.1	90/14.5	90/18.5
2015	90/7	90/48 (90/20 without consideration of the influence adjustment factor)	90/7 (was combined with CI sample)

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, p. 33

Preamble: "Customers were burdened by this approach which was reflected in increased customer complaints related to the extensive duration of site visits."

Question: Please provide a copy of any complaints Union received as a direct result of an increased sample size and the "verification of every project completed at a sampled site."

Response:

Please see the responses at Exhibit B.Staff.16 and at Exhibit B.SEC.6.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, pp. 33-34

Preamble: "EC took this approach without providing evidence to the EAC that the benefits of the approach outweigh its additional time and resource drawbacks. The decision to oversample was questioned by EAC members throughout the EM&V process. The utilities requested that the EC compare CPSV results with and without oversampled projects to determine if study results would appreciably change if the EC did not oversample. This request was refused."

Question: Please provide a copy of that request and the refusal.

Response:

Please see the response at Exhibit B.EP.6.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 2, p. 38

Preamble: "Furthermore, it is Union's contention that the unique design of Union's Large Volume Direct Access program is incompatible with the concept of a NTG Study."

Question:

a) Is Union of the view that the benefits of its Large Volume Direct Access program can't be verified or fully quantified?
b) If the answer to a) is yes, please explain how the Board and gas customers can evaluate the economic efficiency of this program.

Response:

a) & b)

No, Union is not of the view that the Large Volume Direct Access program/project specific results cannot be verified or fully quantified. Rather, it is Union's position that attempting to measure program influence (through a NTG adjustment) on customers who have a direct line-of-site to the available incentive budget they can access is not reasonable. Union's Large Volume Direct Access program provides customers access to their own (rate funded) money for eligible projects. If a customer chooses to not access their own funding, the funds will go to another customer in the rate class to use on a "first-come, first-served" basis. This program design is entirely incompatible with the application of a Free Rider rate. While Union can attempt to influence a customer by providing incentives and identifying/quantifying opportunities to save energy, the customer prioritizes projects depending on its own needs. If a project meets the eligibility criteria of the program, Union will not refuse a customer access to its own money, thus impeding the possibility for Union to affect the associated NTG value.

UNION GAS LIMITED

Answer to Interrogatory from
Energy Probe ("EP")

Reference: Exhibit A, Tab 3, p. 13, Table 4

Question: Can Union explain the low achievement levels of its large volume programs. We're particularly interested given the comments detailed in IR #9 where Union states that it believes the benefits of these programs can't be verified in NTG studies.

Response:

Please see the response at Exhibit B.SEC.35 for an explanation of Large Volume Program performance.

Measuring program influence for this program is not reasonable for the reasons described in the response at Exhibit B.EP.9.

UNION GAS LIMITED

Answer to Interrogatory from
Green Energy Coalition ("GEC")

Reference: Exhibit A, Tab 1, p.7, Table 2

Question:

a. Please confirm that the only difference between the Shareholder Incentive and Lost Revenue values under the "2015 Audited Results" and "2015 Audit Adjusted Results" columns is that the 2015 Audit Adjusted Results column uses different Custom Measure NTG assumptions than the 2015 Audited Results column.
b. If there are differences other than Custom Measure NTG assumptions, please identify all other such differences and explain the basis for them.
c. Please provide Union's calculation of its proposed shareholder incentive, including all relevant assumptions at the measure level (provide at the project or program level for cases in which measure level information is not used), in an Excel spreadsheet with all formulae intact. The calculations provided should include, at a minimum, each of the following for each measure:
    i. the measure name/description (or project or program, if measure level information was not used);
    ii. the number of units participating;
    iii. the gross per unit first year m^3 savings;
    iv. the measure life;
    v. the gross total first year savings across all units (i.e. units multiplied by first year savings);
    vi. the gross total lifetime savings across all units (i.e. units multiplied by first year savings multiplied by measure life);
    vii. the NTG assumption;
    viii. the net total first year savings (i.e. units multiplied by first year savings multiplied by NTG ratio); and,
    ix. the net total lifetime savings (i.e. units multiplied by first year savings multiplied by measure life multiplied by NTG ratio).

Response:

a) & b)
Confirmed.

Please also see the response at Exhibit B.Staff.3 b) & c).

c) Union relied upon a modified version of the EC's shareholder incentive calculator to calculate its proposed shareholder incentive of $7.472M. Union's modified version of the EC

calculator has been provided to GEC in a live Excel spreadsheet via email as Exhibit B.GEC.1.Attachment A, copying the OEB. Other parties who wish to receive a copy of the document can contact Union directly.

The EC shared its shareholder incentive calculator with the EAC in support of the EC's audited shareholder incentive of $7.040M for Union. Union modified the EC calculator to calculate Union's proposed shareholder incentive claim of $7.472M. Changes made by Union within the calculator were only to the NTG values (Free Ridership and Spillover) for Union's CI and Large Volume custom programs. Please see Union's response at Exhibit B.Staff.3 b) for a description of these changes. All other data within Union's modified EC calculator reflects the EC's audit results.

The EC did not provide the EAC with a breakdown of its shareholder incentive calculations to the level of disaggregation requested by GEC.

UNION GAS LIMITED

Answer to Interrogatory from
Green Energy Coalition ("GEC")

Reference: Exhibit A, Tab 2, p. 32

Preamble: Union states that if secondary attribution were included in the NTG results, the NTG rate for its customer C&I program would have increased from 39% to 45% and the NTG for its Large Volume Direct Access program would have increased from 8% to 12%.

Question: Please provide an estimate of how just changing the NTG to include secondary attribution effects would change the EC's estimates of first year savings, lifetime savings and the $7.447 million shareholder incentive shown on Exh A/T1 p. 7, table 2.

Response:

To clarify, the $7.447 million shown in Union's application at Exhibit A, Tab 1, p.7, Table 2 is the total DSM impact, including LRAM, DSMVA and shareholder incentive. The shareholder incentive based on the EC's 2015 audited results is $7.040 million.

Based on the limited Secondary Attribution information provided by the EC, and using the EC's calculator, the estimated impact to savings and shareholder incentive if Secondary Attribution was included in the NTG results is illustrated in Table 1 below.

Table 1

	2015 Audited Results	2015 Audited Results with Secondary Attribution
Net Annual Savings (m3)	73,335,447	83,154,729
Net Lifetime Savings (m3)	1,137,825,562	1,268,672,461
DSMIDA (millions)	$7.040	$8.001

UNION GAS LIMITED

Answer to Interrogatory from
Green Energy Coalition ("GEC")

Reference: Exhibit A, Tab 2, p. 38

Preamble: Union contends that "the unique design of Union's Large Volume Direct Access program is incompatible with the concept of a NTG study."

Question:

a. Is Union suggesting that there is no value in understanding what the NTG ratio is for this program? Please explain the rationale for the response.
b. Is Union suggesting that an NTG ratio not be used for the purpose of assessing the utility's performance relative to goals (and therefore to shareholder incentive calculations)? Please explain the rationale for the response.
c. Is it Union's contention that it cannot have any influence on free ridership for this program – either through provision of technical support, financial analysis and/or other means at its disposal? Or is the company suggesting that while it has some influence over free ridership, that influence is not as great as for customers who are not in self direct programs? Please explain the rationale for the response.

Response:

a) – c)

Please see the responses at Exhibit B.EP.9 and at Exhibit B.SEC.31.

The very nature of the Large Volume Direct Access program significantly hinders Union's ability to influence Free Ridership in comparison with the CI Custom Program.

UNION GAS LIMITED

Answer to Interrogatory from
Green Energy Coalition ("GEC")

Reference: Exhibit A, Tab 2, Appendix A, p. 3

Preamble: In the second bullet under transparency, Union's draft EAC charter states that all calculations of savings estimates or related financial issues would be provided to the utilities to enable them to confirm the reasonableness of said calculations.

Question: Why did Union suggest only the utility members of the EAC would have this opportunity? Why not other members as well?

Response:

Union's intent is that all members of the EAC would have this opportunity. Union's draft EAC charter was meant as a starting point for discussion.

UNION GAS LIMITED

Answer to Interrogatory from
Green Energy Coalition ("GEC")

Reference: Exhibit A, Tab 2, Appendix A, pp. 3 & 4

Preamble: Under the EAC Charter Accountabilities section of its draft EAC Charter, Union identifies a number of items for which "EAC member accountabilities include providing input, guidance and advice." (emphasis added)

Question:

a. To whom would the EAC members be providing such input, guidance and advice?
b. How would decisions that consider such input, guidance and advice be made? Is the intent that the EAC would endeavor to reach consensus as in the past under the TEC? If so, what would happen if there was not consensus – i.e. if there was conflicting input, guidance and advice from different members of the EAC – on non-policy issues such as evaluation priorities in plans, budget allocation, contractor selection, etc.? Who would make decisions in such cases?
c. The proposed charter suggests that any disagreements on policy issues would require adjudication by the Board. Given the frequency with which policy issues have arisen in the EAC discussions over the past two years, wouldn't the need to wait for Board adjudication impose significant delays in completing audits and/or other evaluation work?
d. On p. 2 of Union's proposed EAC Charter, Board Staff is listed separately as the EAC Coordinator and not as an "Active Member" of the EAC. Does that mean that the Union is suggesting that Board Staff would not be accountable – or have the right – to provide "input, guidance and advice" on the bulleted items for which EAC members would be accountable? Please explain the rationale for the response.

Response:

a) – d)

Union's draft EAC charter was meant as a starting point for discussion. Please see the response at Exhibit B.SEC.20 for Union's current EAC charter proposal.

As per the August 21, 2015 letter from the OEB, the role of the EAC is to provide input and advice to the OEB (through OEB Staff) on the evaluation and audit of DSM results. Union's current EAC charter proposal is consistent with this direction.

UNION GAS LIMITED

Answer to Interrogatory from
Green Energy Coalition ("GEC")

Reference: Exhibit B, Tab 1, Appendix A, p.18

Preamble: TRC cost-effectiveness results shown in table 4.0 of Union's 2015 DSM Annual Report.

Question:

a. Please confirm that the "net TRC" column is the net present value (NPV) of "net benefits" (i.e. NPV of benefits minus NPV of costs). If not, please explain what it is and why it is different than NPV of net benefits.
b. Please confirm that the "net TRC" values were computed using the "TRC Plus" methodology (i.e. (1) avoided gas costs with a 15% non-energy benefits adder plus (2) avoided electric costs with a 15% non-energy benefits adder plus (3) avoided water costs). If that is not confirmed, please explain what test was used and why something different than TRC plus was used.
c. Please provide a break-down into the following categories, by program and for the portfolio of programs as whole:
    i. NPV of TRC Benefits broken down by:
        1. Gas benefits (without adders)
        2. Electric benefits (without adders)
        3. Water benefits
        4. Non-energy benefits (i.e. the portion of gas and electric benefits associated with a 15% non-energy benefits adder)
        5. Total
    ii. NPV of costs
    iii. NPV of net benefits
d. Please provide all of the assumptions and calculations underpinning the TRC cost-effectiveness results. Please provide them in Excel, with all formulae intact, disaggregated at the measure level (wherever possible). The assumptions should include:
    i. Measure name
    ii. Number of measures (used for gross savings calculations)
    iii. Per unit incremental cost
    iv. Per unit incentive/rebate cost (please include even though not required for TRC)
    v. Per unit gross first year gas savings
    vi. Per unit gross first year electric savings
    vii. Per unit water savings
    viii. Measure life
    ix. Net-to-gross assumption
    x. Avoided gas costs, with and without non-energy benefits adder
    xi. Avoided electric costs, with and without non-energy benefits adder

xii. Avoided water costs
xiii. Discount rate
xiv. Other program costs (i.e. other than rebates/incentives)
xv. Other portfolio costs (i.e. other than rebates/incentives)

e. For each measure, please also provide each of the following outputs of the cost effectiveness calculations:
i. NPV of TRC Plus costs,
ii. NPV of PAC costs
iii. NPV of TRC Plus gas benefits
iv. NPV of TRC Plus electric benefits
v. NPV of TRC plus water benefits
vi. NPV of TRC Plus total benefits
vii. NPV of PAC benefits
viii. TRC Plus Benefit-cost ratio
ix. PAC benefit-cost ratio

Response:

a) Confirmed.

b) Not confirmed.

Consistent with the direction outlined in the 2015-2020 DSM Framework, Union rolled-forward its 2014 approach to all programs and parameters in 2015,[1] including cost-effectiveness screening. Union used the Total Resource Cost ("TRC") test agreed upon in the EB-2011-0327 Settlement Agreement as the sole method of program cost effectiveness screening. This was disclosed in Union's 2015-2020 DSM Plan.[2]

c)

i. & ii.

The requested data was provided to the EC and the results of their EM&V activities for 2015 are included in the EC's 2015 Annual Verification Report at Exhibit B, Tab 2. This report does not disaggregate the NPV of TRC benefits and NPV of costs in the manner requested.

iii. The NPV of net benefits by program and for the portfolio of programs as a whole can be found in the EC's 2015 Annual Verification Report in Union's application at Exhibit B, Tab 2, pp. 129 & 130, Table M-2 and Table M-3.

[1] EB-2014-0134, DSM Framework, p.37
[2] EB-2015-0029, Application, Exhibit A, Tab 2, p. 24

d) The requested cost-effectiveness data was provided to the EC and the results of their EM&V activities for 2015 are included in the EC's 2015 Annual Verification Report at Exhibit B, Tab 2. Union does not have the final measure-level cost-effectiveness model developed by the EC and used to populate its report.

i. Measure level EC-certified savings based on programs can be found in the appendices C and E of the EC's 2015 Annual Verification Report in Union's application at Exhibit B, Tab 2.

ii. Total number of measures is shown in Table 4.0 of Union's 2015 DSM Final Annual Report in Union's application at Exhibit B, Tab 1, p. 17.

iii. For prescriptive measures, input assumptions are based on the Joint Input Assumption Filing for New and Updated DSM Measures, filed March 27, 2015 (EB-2014-0354). For custom measures, input assumptions are based on project-specific details.

iv. Per unit incentives/rebates can be found within each program section of Union's 2015 DSM Final Annual Report, Exhibit B, Tab 1, by program and offering.

v. – ix.
Please see response to iii) above.

x. – xii.
Avoided costs used in 2015 are included in Section 13 of Union's 2015 DSM Final Annual Report, Exhibit B, Tab 1, p. 80.

xiii. The discount rate used was 5.75%.

xiv. & xv.
Program and portfolio costs are shown in Appendix L of the EC's 2015 Annual Verification Report, in Union's application at Exhibit B, Tab 2, p. 125.

e) As noted in part d) above, Union does not have the final measure-level cost-effectiveness model developed by the EC and used to populate the EC's 2015 Annual Verification Report. Therefore, Union cannot provide this information.

UNION GAS LIMITED

Answer to Interrogatory from
Industrial Gas Users Association ("IGUA")

Reference: Exhibit A, Tab 1, p. 6

Preamble: Union's Application states:
…. Union's 2015 audit adjusted DSM results include OEB-approved 2014 NTG adjustment factors. … Union requests that the OEB approve the 2015 audit adjusted results as presented on the basis of the arguments summarized above and described in further detail herein.

IGUA has reviewed the interrogatories recently filed by several other parties herein. IGUA wishes to clearly understand how and when "spillover" has been applied in evaluating Union's DSM program results.

Question:

a) Please provide each of the "spillover" and "free ridership" adjustment factors included in the OEB-approved 2014 NTG adjustment factors referenced by Union.
b) Please confirm that the "spillover" and "free ridership" adjustment factors provided in response to part a) are those used by Union in calculating its *"audit adjusted results"* as presented in the instant application.
c) Please provide specific reference to the OEB determinations relied on by Union in asserting OEB approval of each of the "spillover" and "free ridership" adjustment factors provided in response to part a).
d) Please provide all documentation previously filed with the Board supporting the "spillover" adjustment factor provided in response to part a).
e) Please explain Union's understanding of the status of the ongoing Commercial and Industrial Custom Project net-to-Gross Study and when it will be completed and presented to the Board for approval.

Response:

a) The Free Ridership adjustment factors were included in Union's OEB-approved Final Audited 2014 Annual Report and are provided in Table 1 below.[1] Union does not have an OEB-approved Spillover rate. For each measure below, this is equivalent to a 0% Spillover rate.

[1] EB-2015-0276, Application, Exhibit B, Tab 1, DSM 2014 Annual Report, Appendix D.

Table 1

	Measure Name	Free Rider
NC/ BR[2]	Air Curtains-Shipping >=64 sq ft & < 80 sq ft	5%
	Air Curtains-Shipping >=100 sq ft	5%
	Condensing Boiler SH - 300 to 999 MBtu/hr	5%
	Condensing Boiler SH - 300 to 999 MBtu/hr LIMF	5%
	Condensing Boiler SH - => 1,000 MBtu/hr	5%
	Condensing Boiler SH - => 1,000 MBtu/hr LIMF	5%
	Condensing Boiler WH - 300 to 999 MBtu/hr	5%
	Condensing Boiler WH - 300 to 999 MBtu/hr LIMF	5%
	Condensing Boiler WH - => 1,000 MBtu/hr	5%
	Condensing Gas Water Heater 1- 100gal/day	5%
	Condensing Gas Water Heater 2- 500gal/day	5%
	Condensing Gas Water Heater 3- 1000gal/day	5%
	Condensing Gas Water Heater 3- 1000gal/day LIMF	5%
	Custom Equip Baseload	5% LI; 54% CI
	Custom Equip Baseload/Weather	54%
	Custom Equip Weather	5% LI; 54% CI
	Custom Infrared Poly Baseload	54%
	DCKV < 5000 cfm	5%
	DCKV 5000 - 9999 cfm	5%
	Destratification Fan	10%
	Dishwasher - Rack Conveyor Multi HT	27%
	Dishwasher - Rack Conveyor Single HT	27%
	Dishwasher - Stationary Rack Door Type HT	20%
	Dishwasher - Stationary Rack Door Type LT	20%
	Dishwasher - Stationary Rack Single Rack HT	20%
	Dishwasher - Undercounter HT	40%
	Dishwasher - Undercounter LT	40%
	Energy Star Fryer	20%
	Infrared Heating 1- 20-99 MBtu/hr 1-Stage	33%
	Infrared Heating 2- 100-300 MBtu/hr 1-Stage	33%
	Infrared Heating 3- 20-99 MBtu/hr 2-Stage	33%
	Infrared Heating 4- 100-300 MBtu/hr 2-Stage	33%
	MUA 01- MURB&LTC Imp Effic 1000-4999cfm	5%
	MUA 01- MURB&LTC Imp Effic 1000-4999cfm LIMF	5%
	MUA 02- MURB&LTC Imp Effic =>5000 cfm	5%
	MUA 02- MURB&LTC Imp Effic =>5000 cfm LIMF	5%
	MUA 04- MURB&LTC Effic + 2 speed =>5000 cfm	5%
	MUA 05- MURB&LTC Effic + VFD 1000-4999 cfm LIMF	5%
	MUA 06- MURB&LTC Effic + VFD => 5000 cfm	5%
	MUA 06- MURB&LTC Effic + VFD => 5000 cfm LIMF	5%
	MUA 07- Other Comm Imp Effic 1000-4999 cfm	5%
	MUA 09- Other Comm Effic + 2 speed 1000-4999cfm	5%
	MUA 11- Other Comm Effic + VFD 1000-4999 cfm	5%
	MUA 12- Other Comm Effic + VFD =>5000 cfm	5%
	Non-Condensing Boiler SH - 300 to 999 MBtu/hr MF	20%
	Non-Condensing Boiler SH - =>1,000 MBtu/hr MF	20%
	Non-Condensing Boiler SH - =>1,000 MBtu/hr NMF	12%
	Non-Condensing Boiler WH - 300 to 999 MBtu/hr MF	20%
	Non-Condensing Boiler WH - =>1,000 MBtu/hr MF	20%
	Non-Condensing Boiler WH - =>1,000 MBtu/hr NMF	12%
	Ozone WE =< 60 lbs cap & 100,000 to 199,999lbs/yr	8%

[2] New Construction / Building Retrofit (or Replacement)

	Measure Name	Free Rider
	Ozone WE =< 60 lbs cap & => 200,000 lbs/yr	8%
	Ozone WE >60 lbs & =< 120lbs & => 200,000 lbs/yr	8%
	Ozone WE > 120lbs & <500lbs & => 260,000 lbs/yr	8%
NC only	Condensing Boiler SH - up to 299 MBtu/hr	5%
	Condensing Boiler WH - up to 299 MBtu/hr	5%
	DCV-Office-RTU/MUA up to 2499 sq ft-w/o plan	20%
	DCV-Retail-RTU/MUA up to 4999 sq ft-w/o plan	20%
	DCV-Retail-RTU/MUA => 5000 sq ft-w/o plan	20%
	ERV 1- up to 1999 cfm MURB,Healthcare,Nursing	5%
	ERV 2- => 2000 cfm MURB,Healthcare,Nursing	5%
	ERV 3- up to 1999 cfm Hotel,Restaurant,Retail	5%
	ERV 4- => 2000 cfm Hotel,Restaurant,Retail	5%
	ERV 5- up to 1999 cfm Off,Whse,Ed & All Other Comm	5%
	ERV 6- => 2000 cfm Off,Whse,Ed & All Other Comm	5%
	HRV 1- 500 to 1999cfm-Hotel,Restaurant,Retail,Rec	5%
	HRV 2- =>2,000cfm-Hotel,Restaurant,Retail,Rec	5%
	HRV 3- 500 to 1999cfm-Off,Whse,Man,Ed,Other Comm	5%
	HRV 4- =>2,000cfm-Off,Whse,Man,Ed,Other Comm	5%
	HRV 5- MURB,Healthcare,Nursing	5%
BR only	Air Curtains-Pedestrian >=48 sq ft & < 96 sq ft	5%
	Air Curtains-Pedestrian >=96 sq ft	5%
	Basic-Faucet Aerator-Bath	1%
	Basic-Faucet Aerator-Kitchen	1%
	Basic-Pipe Insulation - 2m	1%
	Basic-Showerhead-1.25 gpm existing 2.0-2.5	1%
	Basic-Showerhead-1.25 gpm existing 2.6+	1%
	Basic-Thermostat-Programmable	1%
	Condensing Boiler SH - up to 299 MBtu/hr	5%
	Condensing Boiler SH - up to 299 MBtu/hr LIMF	5%
	Condensing Boiler WH - up to 299 MBtu/hr	5%
	Condensing Boiler WH - up to 299 MBtu/hr LIMF	5%
	Custom O&M Baseload	54%
	Custom O&M Baseload/Weather	54%
	Custom O&M Weather	54%
	DCV-Office-RTU/MUA up to 2499 sq ft-w/o plan	5%
	DCV-Office-RTU/MUA => 2500 sq ft-w/o plan	5%
	DCV-Retail-RTU/MUA up to 4999 sq ft-w/o plan	5%
	DCV-Retail-RTU/MUA => 5000 sq ft-w/o plan	5%
	Deep Measure-no Furnace	15%
	Deep Measure-with Furnace	15%
	Non-Deep Measure-no Furnace	15%
	Non-Deep Measure-with Furnace	15%
	ERV 1- up to 1999 cfm MURB,Healthcare,Nursing	5%
	ERV 2- => 2000 cfm MURB,Healthcare,Nursing	5%
	ERV 3- up to 1999 cfm Hotel,Restaurant,Retail	5%
	ERV 4- => 2000 cfm Hotel,Restaurant,Retail	5%
	ERV 5- up to 1999 cfm Off,Whse,Ed & All Other Comm	5%
	ERV 6- => 2000 cfm Off,Whse,Ed & All Other Comm	5%
	ESK Install - Energy-efficient Showerhead	10%
	ESK Install - Kitchen Faucet Aerator	33%
	ESK Install - Bathroom Faucet Aerator	33%
	ESK Install - Pipe Wrap	4%
	ESK Pull - Energy-efficient Showerhead	10%
	ESK Pull - Kitchen Faucet Aerator	33%
	ESK Pull - Bathroom Faucet Aerator	33%
	ESK Pull - Pipe Wrap	4%
	ESK Push - Energy-efficient Showerhead	10%
	ESK Push - Kitchen Faucet Aerator	33%
	ESK Push - Bathroom Faucet Aerator	33%

Measure Name	Free Rider
ESK Push - Pipe Wrap	4%
ESK D2D - Energy-efficient Showerhead	10%
ESK D2D - Kitchen Faucet Aerator	33%
ESK D2D - Bathroom Faucet Aerator	33%
ESK D2D - Pipe Wrap	4%
HHC-Whole Home-Private Home	0%
HHC-Whole Home-Social Housing	0%
HRV 1- 500 to 1999cfm-Hotel,Restaurant,Retail,Rec	5%
HRV 2- =>2,000cfm-Hotel,Restaurant,Retail,Rec	5%
HRV 3- 500 to 1999cfm-Off,Whse,Man,Ed,Other Comm	5%
HRV 4- =>2,000cfm-Off,Whse,Man,Ed,Other Comm	5%
HRV 5- MURB,Healthcare,Nursing	5%
Astat - WIFI $25	43%
Pstat- D2C $25	43%
Pstat- HVAC $25	43%
Pstat- HVAC No Incent$	43%
Smart thermostats $25	43%

b) Confirmed.

c) The OEB approved Union's 2014 DSM Deferrals application; specifically, the deferral and variance account balances were approved as filed.[3] This includes the results as presented in Union's final 2014 DSM Annual Report which used the Free Ridership factors noted at part a) above.

d) As per Union's response at part a) above, Union does not have an OEB-approved Spillover rate.

e) Union's understanding of the status of the ongoing Spillover component of the EC's custom NTG Study is that the EC is currently analyzing additional customer responses it received when going back in field in February-March 2018. Timelines for study completion or presentation to OEB Staff have not been communicated to Union.

[3] EB-2015-0276, Decision, June 23, 2016, p. 3.

UNION GAS LIMITED

Answer to Interrogatory from
Industrial Gas Users Association ("IGUA")

Reference: Exhibit A, Tab 2, p. 41

Preamble: Union's Application states:
Union requests that the OEB…

- Direct the EC to exclude Union's Large Volume program from the NTG Study on the basis that measurement of whether decision making was influenced by the program incentives is incompatible with this program since the incentives accessible to customers are their own DSM contributions;

Question:

a) Please clarify what adjustment factors in addition to "free ridership" adjustment, Union applies to the results of its Large Volume DSM program, how such additional adjustment factors are derived, and what evidence Union relies on in support of the appropriateness of such additional adjustment factors.

Response:

a) In addition to the Free Ridership adjustment, CPSV adjustments are applied annually based on the results of verification work. Specifically, the CPSV adjustment is based on:

   i. A sample of Large Volume custom projects designed to reach a 90/10 degree of statistical significance;

   ii. Pre-verification review of the project file by a third party verification consultant;

   iii. On-site verification of the project that most often includes the pull and review of related consumption data; and,

   iv. Validation of the verification findings by a third party hired to audit the DSM portfolio.

UNION GAS LIMITED

Answer to Interrogatory from
Industrial Gas Users Association ("IGUA")

Reference: Exhibit A, Tab 3, Appendix A, Schedule 3

Preamble: Union's evidence indicates that actual 2015 DSM costs:

- For Rate T1 customers were $0.887 million.
- For Rate T2 customers were $2.672 million.
- For Rate 100 customers were $0.797 million.

Question:

a) Please indicate how much of the actual DSM costs for each of the T1, T2 and Rate 100 customer classes in 2015 were for customer DSM incentives (including, in the case of Rate T2 and 100 customers, access to the customer's own DSM related rate payments).
b) Please break down, for each of Rates T1, T2 and 100, by cost category, the difference between actual 2015 DSM costs and the amounts indicated in response to part (a).

Response:

a) Please see the breakdown in Table 1 below of the DSM incentive costs allocated to the requested rate classes:

Table 1

Line No.	Particulars ($)	Incentives
1	T1	475,306
2	T2	1,357,769
3	R100	386,076
4		2,219,151

b) Please see the breakdown in Table 2 below of the total DSM costs allocated to the requested rate classes:

Table 2

2015 Actual DSM Costs - T1, T2 and R100

Line No.	Particulars ($)	Incentives	Promotion	Evaluation	Administration	Portfolio Budget Share (1)	Low Income Cost Allocation	Total
1	T1	475,306	885	26,237	185,040	76,875	122,799	887,143
2	T2	1,357,769	2,529	74,949	528,590	219,603	488,861	2,672,302
3	R100	386,076	719	21,312	150,303	62,443	175,778	796,631
4		2,219,151	4,134	122,498	863,933	358,922	787,438	4,356,076

(1) Includes share of Incremental DSM Projects 2015 Budget Spend

UNION GAS LIMITED

Answer to Interrogatory from
London Property Management Association ("LPMA")

Reference: Exhibit A, Tab 3, Appendix A, Schedule 3

Question: Please explain why Union under spent on DSM activities in the North while over spending on DSM activities in the South, notable in Rates M1, M4 and M7.

Response:

As noted in Union's application at Exhibit A, Tab 3, p. 6, DSM program costs are allocated by customer class and assigned by rate class based on the percentage allocation of customer incentive costs. Therefore, DSM participation by customers in their respective rate class drives the magnitude of costs attributed to each rate class.

Higher DSM participation in rate class M1 was driven by strong participation in the Residential Home Renovation Rebate program, which was only offered to customers in the South in 2015.

Higher costs attributed to the M4 and M7 rate classes compared to what was included in rates is attributable to strong participation in Union's Custom Program by customers in those respective rate classes.

UNION GAS LIMITED

Answer to Interrogatory from
London Property Management Association ("LPMA")

Reference: Exhibit A, Tab 3, Table 2
Exhibit A, Tab 4, Appendix A, Schedule 1

Question: For each of the line items shown in Table in Exhibit A, Tab 3, please show the allocation to rate classes of the actual audit adjusted results in the same format as shown in Exhibit A, Tab 4, Appendix A, Schedule 1.

Response:

Please see Attachment A.

UNION GAS LIMITED
Allocation of 2015 Incentive Results by Scorecard
2015 - Audit Adjusted

Line No.	Particulars ($000's)	Union North					Union South										Total (1)
		Rate 01	Rate 10	Rate 20	Rate 100	Rate 25	M1	M2	M4	M5A	M7	M9	M10	T1	T2	T3	
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
	Scorecard:																
1	Resource Acquisition	109,603	119,510	159,824	-	-	1,788,704	747,880	649,590	236,532	631,583	-	-	-	-	-	4,443,226
2	Large Volume T2/T1/R100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Low-Income	545,929	59,555	-	-	-	1,330,358	482,203	44,488	-	-	-	-	-	-	-	2,462,534
4	Market Transformation	119,794	-	-	-	-	446,927	-	-	-	-	-	-	-	-	-	566,721
5	Total DSM Incentive	655,532	179,065	159,824	-	-	3,119,062	1,230,083	694,078	236,532	631,583	-	-	-	-	-	7,472,481

Notes:
(1) Exhibit A, Tab 3, p. 11, Table 2.

UNION GAS LIMITED

Answer to Interrogatory from
London Property Management Association ("LPMA")

Reference: Exhibit A, Tab 4, pages 2-3

Preamble: Union proposes to allocate the balance in the Demand Side Management Incentive Deferral Account ("DSMIDA") (no. 179-126) to rate classes in proportion to the actual DSM spending by rate class in 2015 for scorecards where Union has achieved a DSM incentive.

Question:

a) Please confirm that Union is not allocating any of the DSMIDA balance to rates T1, T2, or 100 because Union did not achieve a DSM incentive related to these customers.
b) Has Union applied this approach to the allocation of the DSMIDA balances for previous years in which it did not achieve a DSM incentive for some rate classes? If yes, please provide details.
c) If the response to part (b) is no, please explain the rationale for not allocating any of the DSMIDA balance to the rate classes where Union did not achieve a DSM incentive.

Response:

a) Confirmed.

Union is not allocating any DSMIDA balance to rates T1, T2 and 100 because Union did not achieve any DSM Incentive earnings on the Large Volume Scorecard.

b) & c)

Union has applied the same approach to the allocation of the DSMIDA balances since the inception of the DSMIDA deferral account in 2012. In 2014, the Large Volume Scorecard did not achieve a DSM Incentive and rate classes T1, T2 and 100 were not allocated any of the DSMIDA balance.

UNION GAS LIMITED

Answer to Interrogatory from
London Property Management Association ("LPMA")

Reference: Exhibit A, Tab 3, Table 5

Question:

a) How has Union allocated the low-income scorecard incentive achieved in previous year dispositions? In particular, which rate classes are allocated amounts related to the low-income scorecard incentive?
b) If the allocation provided in the response to (a) above is different than the allocation of the low-income DSM budget variance described at page 7 of Exhibit A, Tab 3, please explain the different allocations proposed.

Response:

a) Union has allocated the Low-Income scorecard incentive in previous year dispositions in the same fashion it proposes to allocate the 2015 Low-Income scorecard incentive. As detailed in Union's response at Exhibit B.LPMA.2, the Low-Income scorecard incentive was allocated to rate classes M1, M2, M4, 01 and 10.

b) The allocation methodologies proposed for the DSMVA and the DSMIDA are described in Union's application at Exhibit A, Tab 4, pp. 2-3. The allocation approach for the DSMVA is consistent with the description at Exhibit A, Tab 3, p. 7. The allocation approach for the DSMIDA is to allocate the balance to rate classes in proportion to the actual DSM spending by rate class in 2015 scorecards where Union has achieved a DSM incentive.

UNION GAS LIMITED

Answer to Interrogatory from
London Property Management Association ("LPMA")

Reference: Exhibit A, Tab 4, Appendix A & Appendix B

Question:

a) Please provide versions of Schedule 2 (page 1 only) and Schedule 3 of Appendix A assuming rate implementation takes place as part of the July 1 QRAM.
b) Please provide versions of Schedule 2 (page 1 only) and Schedule 3 of Appendix B assuming rate implementation takes place as part of the July 1 QRAM.
c) Please confirm that the one-time adjustment for contract rate classes will not be impacted by a delay from the implementation form the April QRAM to the July QRAM. If this cannot be confirmed, please explain fully and provide updated Schedule 2 (page 2) of both Appendix A and Appendix B.

Response:

a) Please see Attachment A.

b) Please see Attachment B.

c) Not confirmed.

There would be a small difference to the one-time adjustment for contract rate classes to account for the interest calculated on account balances between April QRAM and July QRAM. Union will calculate the interest up to the date of disposition as part of the final rate order.

UNION GAS LIMITED
General Service Unit Rates for Prospective Recovery/(Refund) - Delivery
DSM Deferral Account Disposition
Updated for July 1, 2018 to December 31, 2018 Dispostion Period
2015 - Audit Adjusted

Line No.	Particulars	Rate Class	Deferral Balance for Disposition ($000's) (1)	Forecast Volume (10^3m^3) (2)	Unit Rate for Prospective Recovery/(Refund) (cents/m^3)
			(a)	(b)	(c) = (a / b) * 100
	Union North				
1	Small Volume General Service	01	(288)	357,304	(0.0806)
2	Large Volume General Service	10	(269)	150,880	(0.1782)
	Union South				
3	Small Volume General Service	M1	5,989	1,107,423	0.5408
4	Large Volume General Service	M2	946	501,715	0.1885
5	Total General Service		6,378		

Notes:
(1) Exhibit A, Tab 4, Appendix A, Schedule 1.
(2) Forecast volume for the period July 1, 2018 to December 31, 2018.

UNION GAS LIMITED
General Service Bill Impacts
Updated for July 1, 2018 to December 31, 2018 Dispostion Period
2015 - Audit Adjusted

Line No.	Particulars	Rate Component	Unit Rate for Prospective Recovery/(Refund) (cents/m^3) (1)	Volume (m^3) (2)	Bill Impact ($)
			(a)	(b)	(c) = (a x b) / 100
1	Rate 01	Delivery	(0.0806)	857	(0.69)
2		Commodity	-	857	-
3		Transportation	-	857	-
4			(0.0806)		(0.69)
5	Sales Service				(0.69)
6	Direct Purchase Bundled T				(0.69)
7	Rate 10	Delivery	(0.1782)	38,833	(69.20)
8		Commodity	-	38,833	-
9		Transportation	-	38,833	-
10			(0.1782)		(69.20)
11	Sales Service				(69.20)
12	Direct Purchase Bundled T				(69.20)
13	Rate M1	Delivery	0.5408	702	3.80
14		Commodity	-	702	-
15			0.5408		3.80
16	Sales Service				3.80
17	Direct Purchase				3.80
18	Rate M2	Delivery	0.1885	23,871	45.00
19		Commodity	-	23,871	-
20			0.1885		45.00
21	Sales Service				45.00
22	Direct Purchase				45.00

Notes:
(1) Exhibit B.LPMA.05, Attachment A, p.1, column (c).
(2) Average consumption, per customer, for the period July 1, 2018 to December 31, 2018.

UNION GAS LIMITED
General Service Unit Rates for Prospective Recovery/(Refund) - Delivery
DSM Deferral Account Disposition
Updated for July 1, 2018 to December 31, 2018 Dispostion Period
2015 - Audited

Line No.	Particulars	Rate Class	Deferral Balance for Disposition ($000's) (1)	Forecast Volume (10^3m^3) (2)	Unit Rate for Prospective Recovery/(Refund) (cents/m^3)
			(a)	(b)	(c) = (a / b) * 100
	Union North				
1	Small Volume General Service	01	(299)	357,304	(0.0836)
2	Large Volume General Service	10	(280)	150,880	(0.1859)
	Union South				
3	Small Volume General Service	M1	5,815	1,107,423	0.5251
4	Large Volume General Service	M2	873	501,715	0.1740
5	Total General Service		6,109		

Notes:
(1) Exhibit A, Tab 4, Appendix B, Schedule 1.
(2) Forecast volume for the period July 1, 2018 to December 31, 2018.

UNION GAS LIMITED
General Service Bill Impacts
Updated for July 1, 2018 to December 31, 2018 Dispostion Period
2015 - Audited

Line No.	Particulars	Rate Component	Unit Rate for Prospective Recovery/(Refund) (cents/m^3) (1)	Volume (m^3) (2)	Bill Impact ($)
			(a)	(b)	(c) = (a x b) / 100
1	Rate 01	Delivery	(0.0836)	857	(0.72)
2		Commodity	-	857	-
3		Transportation	-	857	-
4			(0.0836)		(0.72)
5	Sales Service				(0.72)
6	Direct Purchase Bundled T				(0.72)
7	Rate 10	Delivery	(0.1859)	38,833	(72.19)
8		Commodity	-	38,833	-
9		Transportation	-	38,833	-
10			(0.1859)		(72.19)
11	Sales Service				(72.19)
12	Direct Purchase Bundled T				(72.19)
13	Rate M1	Delivery	0.5251	702	3.69
14		Commodity	-	702	-
15			0.5251		3.69
16	Sales Service				3.69
17	Direct Purchase				3.69
18	Rate M2	Delivery	0.1740	23,871	41.54
19		Commodity	-	23,871	-
20			0.1740		41.54
21	Sales Service				41.54
22	Direct Purchase				41.54

Notes:
(1) Exhibit B.LPMA.05, Attachment B, p.1, column (c).
(2) Average consumption, per customer, for the period July 1, 2018 to December 31, 2018.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Greenhouse Vegetable Growers ("OGVG")

Reference: Exhibit A, Tab 4, p. 3

Preamble: For in-franchise contract rate classes, Union is proposing to dispose of the net 2015 DSM-related deferral and variance account balances as a one-time adjustment with the first available QRAM after Board approval. This one-time adjustment approach is consistent with the methodology used for the disposition of 2014 deferral account and earnings sharing balances in the 2014 Disposition of DSM Deferral and Variance Accounts (EB-2015-0276) proceeding.

Question:

a) Please provide a table (or tables) that show the following information:
   i) the number of customers within each in-franchise contract class that Union forecasts it will charge a one-time adjustment relating to the 2014 LRAM, DSMVA and DSMIDA accounts if this application is approved;
   ii) for each in-franchise contract class the minimum, maximum, average, and median one-time adjustments Union forecasts it will charge if this application is approved, along with the related % distribution and total bill impact for each representative charge (namely the % impact of the one-time charge in relation to the annual distribution and total bill for the relevant customer).

b) Please confirm that in-franchise contract class customers continue to have the option of paying the approved one-time adjustment over time; if so confirmed please provide the process by which customers seeking to make their payment over time may arrange to do so, and explain how the maximum time period available to customers for such payments is determined. If not confirmed, please explain why this option is no longer available to in-franchise contract customers.

Response:

a) Please see Attachment A.

b) Confirmed.

In-franchise contract class customers one-time adjustment invoice is payable when the invoice is due and late payment charges will apply for unpaid amounts. Customers may contact their Account Manager to request alternative payment arrangements, for a maximum period of 6 months; these requests will be considered depending on customers unique circumstances on a case by case basis.

UNION GAS LIMITED
Bill Impact of 2015 DSM Deferral Acount Disposition
One-Time Adjustment for Contract Customers

Line No.	Particulars	Number of Customers	2015 DSM One-Time Adjustment ($)	Percent of Delivery Bill	Percent of Total Sales Bill (1)
		(a)	(b)	(c)	(d)
	Union South				
1	Rate M4	182			
2	Minimum		92	0.4%	0.4%
3	Maximum		39,842	7.7%	2.0%
4	Average		11,521	13.5%	2.3%
5	Median		9,202	11.1%	2.2%
6	Rate M5	94			
7	Minimum		(65,755)	(24.1%)	(2.9%)
8	Maximum		(1,311)	(8.8%)	(2.4%)
9	Average		(11,980)	(19.0%)	(2.8%)
10	Median		(9,205)	(18.0%)	(2.7%)
11	Rate M7	32			
12	Minimum		9,794	1.5%	1.1%
13	Maximum		261,012	28.6%	3.1%
14	Average		77,044	21.2%	3.0%
15	Median		67,698	32.6%	3.2%
16	Rate T1	38			
17	Minimum		(72,696)	(13.3%)	(1.2%)
18	Maximum		(1,497)	(3.2%)	(0.9%)
19	Average		(25,243)	(9.4%)	(1.1%)
20	Median		(21,974)	(11.9%)	(1.2%)
21	Rate T2	22			
22	Minimum		(1,317)	(0.0%)	(0.0%)
23	Maximum		(40)	(0.0%)	(0.0%)
24	Average		(397)	(0.0%)	(0.0%)
25	Median		(246)	(0.0%)	(0.0%)
	Union North				
26	Rate 20	60			
27	Minimum		6	0.1%	0.0%
28	Maximum		12,622	0.3%	0.0%
29	Average		667	0.3%	0.0%
30	Median		320	0.1%	0.0%
31	Rate 100	16			
32	Minimum		(256,804)	(5.7%)	(0.3%)
33	Maximum		(1,168)	(2.3%)	(0.3%)
34	Average		(61,870)	(6.2%)	(0.3%)
35	Median		(45,177)	(9.1%)	(0.3%)

Notes:
(1) Sales bills were estimated based on the customer's delivery bill and their consumption multiplied by Union's average gas supply charges in 2015.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Sustainable Energy Association ("OSEA")

Reference: Exhibit A, Tab 1, p. 3

Preamble: Union's concerns with the 2015 DSM EM&V process and results are detailed in Exhibit A, Tab 2 and are summarized below:

- The 2015 DSM EM&V process and results inappropriately apply the results of the Evaluation Contractor's incomplete and ongoing commercial and industrial Custom Project NTG Study to Union's 2015 DSM program results retroactively.
- The 2015 DSM EM&V process lacks the collaboration, transparency, and predictability claimed by the OEB as justification for assuming control of the process
- The 2015 DSM EM&V process is delayed and not aligned with the Scope of Work.

Question:

a. Please outline the timetable and major events for:
   i. the 2015 evaluation and audit process completed by the Evaluation Contractor
   ii. the evaluation and audit process for previous years when Union managed the process with participation of the Technical Evaluation Committee (TEC) and each of the company specific Evaluation Committee (EC) post 2011.
b. Please advise what Union recommends to reduce delays seen in the 2015 EM&V process.
c. Please advise what takeaways from the previous process, where the Technical Evaluation Committee (TEC) and company specific Evaluation Committees operated primarily on a consensus basis with intervenor representatives can be used to improve the collaboration within the EM&V process moving forward.
d. Please list the major decisions during the EM&V process that were directed by Board staff rather than the EAC.
e. Was Union informed whether the expert members of the EAC were informed of these directions in advance?
f. Please describe any specific improvements in the current EM&V process compared to the Stakeholder developed process approved by the Board in the 2011 proceeding.
g. Please outline the impacts of the delayed 2015 EM&V process on the following:
   i. Customers and customer representatives
   ii. Company Evaluation Staff
   iii. Commercial and Industrial Customer representatives
   iv. Company Program Development Staff.
h. Please outline the impact of the lack of transparency on the following, including any differences between the process established in 2011 and the current process:
   i. Decision making
   ii. Participation of Union representatives on the EAC

iii. Participation of Expert representatives, and
iv. Union's ability to replicate evaluation results and understand the application of the modelling and other processes used by the Evaluation Contractor and the direction provided to subcontractors.

i. Please describe the top three major impacts to audit results resulting from any deviation from best practices.

j. Please describe Union's view of the process and results of the following:
   i. Free Riders, including the validity of survey results, transparency of modelling survey comments, and assessment of customer responses.
   ii. Spillover, including the application of deemed results from study estimates in the United States.

Response:

a) i) & ii)
Union interprets Evaluation Committee to refer to the audit committees in place for each of the 2012-2014 annual audits. For clarity, the TEC was not involved in the annual audit process but did provide input into the CPSV and audit scopes of work in addition to the work they undertook. Please see the response at Exhibit B.SEC.7.

b) A clearly defined Charter of roles and responsibilities for the EAC and the work they advise on would support the more effective management of evaluation work.

In addition, Union recommends that evaluation work be separated from annual verification and audit work, so that evaluation work deliverables do not delay the annual audit process unnecessarily.

c) There are many lessons to apply from the previous EM&V processes to improve current and future OEB Staff coordinated EM&V work. Paramount among these is collaboration in the activities summarized below.

   i. Create EM&V Scopes of Work that are adhered to unless the committee has been consulted and determined it necessary to alter the original scope;

   ii. Select prospective proponents to undertake the work in a transparent manner;

   iii. Document meeting discussions and outcomes through minutes and quarterly reports to support the transparency of the committee activities; and,

   iv. Share the projected budgets and contract budgets with the committee.

d) & e)
The EAC is meant to provide input and advice to OEB Staff and the EC on the evaluation and audit of DSM programs. No decisions, major or otherwise, were directed by the EAC. Rather, all major decisions were directed by OEB Staff or the EC.

Union does not have access to internal communications between OEB Staff and the EC but can identify two instances where OEB Staff directed major decisions rather than the EC. The two instances are detailed in Union's application at Exhibit A, Tab 2, pp. 18-21, and are described below.

1. OEB Staff directed the EC to apply a deemed Spillover rate to Union's Commercial Industrial and Large Volume custom programs without EAC consultation; and

2. OEB Staff directed the EC to apply the incomplete and ongoing NTG Study to 2015 DSM program results.

No EAC members were informed of these directions sufficiently in advance, as far as Union is aware.

f) Please see the response at Exhibit B.SEC.2.

g) The impact of the delayed EM&V process on the various stakeholders identified are as follows:

i) The impacts of the delayed 2015 EM&V process on customers are three-fold:

1) With a clearance of 2015 DSM shareholder incentive, LRAM and variance account amounts in 2018 at the earliest, the customers impacted by rate changes are less likely to be the same customers that benefitted from these programs;

2) To the extent that the OEB Staff-coordinated EM&V process for 2016 proceeds more expediently than the process for 2015, customers could experience two years of DSM-related rate impacts in the same year; and

3) Customers cannot benefit from improvements to DSM programs stemming from 2015 audit findings until 2018. Customers are also required to remember project details that occurred more than 18 months previous in many cases, which can add additional burden in cases where they are required to provide explanation.

ii) A delayed 2015 EM&V process restricts company evaluation staff's ability to receive and communicate audit findings and recommendations on a timely basis. 2015 audit findings and recommendations can only be applied to the 2018 program year at the earliest. This three to four year gap runs counter to Union's efforts to operate under an environment of continuous improvement. Further, delay of the

EM&V process and of EM&V budgetary requirements restricts evaluation staff's ability to plan and budget accordingly for other evaluation studies that might benefit the delivery and success of DSM programs. Additionally, Union anticipates increased demand for resources in support of advancing the EM&V processes for the 2016 DSM program year and beyond in an effort to catch-up and return to a more reasonable EM&V timeline in the future.

iii) In addition to the impacts described at part i) above, commercial and industrial customer representatives with projects from 2015 were impacted by having to remember details from projects that were commissioned on average two years in the past. This risks increasing customer recall bias and decreasing the quality of information customers have provided for the purpose of custom project verification and the EC's NTG Study conducted in 2017 and 2018. It also risks increasing the likelihood that customer employees active in commissioning projects in 2015 are no longer available for the purposes of EM&V activities conducted two years later.

iv) Similar to the impacts described at part ii) above, a delayed 2015 EM&V process restricts company program development staff from implementing and acting upon audit findings and recommendations on a timely basis.

h) The impact of the lack of transparency on the identified factors are as follows:

i) The lack of transparency caused ambiguity in Union's strategic decision making, and has challenged DSM accounting and reporting. Lack of budget transparency also limited any opportunity to explore additional evaluation work outside the scope of the EAC (e.g. process evaluation).

ii) As a result of lack of transparency, Union representatives were not able to optimally act within their advisory role and cannot speculate on the impact of information exchanged between the EC and OEB Staff on the EM&V process for 2015. Union maintains that this activity is not appropriate. Union notes that under the 2012-2014 DSM Framework it did not withhold comments from the TEC or Audit Committee related to projects within their oversight. Further, lack of transparency also impeded Union's ability to reproduce the EC's findings.

iii) Having experts involved in the annual audit process is new for the 2015 DSM program year. Union believes that these experts have contributed positive insights and perspective to the audit process. However, Union cannot comment on how the lack of transparency has impeded their ability to participate in the process.

iv) In audit processes under previous DSM Frameworks, Union could validate the changes the auditor made through the provision and exchange of live calculators. There have been numerous historical instances where this transparency enabled the identification and correction of errors. Not having access to all EC calculations made it impossible to

clearly see the mechanisms and mathematical approaches behind adjustments, and thus impacted Union's ability to confirm the DSMI. A lack of transparency on the direction provided to subcontractors limits Union's ability to comment on this impact.

i) To clarify, Union's interpretation of best practices, are those activities, methodologies and procedures shown by research and experience to produce optimal results in terms of quality and/or efficiency. Deviations from best practices risk eroding confidence in results and decreasing efficiencies in the time and resources needed.

The top three major impacts to audit results resulting from deviations from best practices are described below.

1. Not providing live calculations made it impossible to validate the adjustments made by the auditor, particularly in relation to a number of custom projects.

2. As outlined in Union's application at Exhibit A, Tab 2, pp. 36-40, best practices were not followed when the EC conducted its NTG Study, and in particular, it is Union's position that the delay in fielding the Free Rider survey had a negative impact on the results.

3. Delay in fielding CPSV can impact customers' ability to speak knowledgeably about projects.

j)

i) It is Union's position that the delay in fielding the NTG Study negatively impacted the Free Ridership results. Additionally, Union questions whether adequate training or orientation was provided to interviewers to ensure they had a base understanding of Union's programs. This could also have impacted both the customer responses and the interpretation that the interviewers made to score the response. Please also see the response at Exhibit B.BOMA.10.

ii) It is Union's position that OEB Staff's decision to direct DNV GL to apply a Spillover value from another jurisdiction without any EAC consultation was an inappropriate divergence from the NTG Study Scope of Work.

UNION GAS LIMITED

Answer to Interrogatory from
Ontario Sustainable Energy Association ("OSEA")

Reference: Exhibit B, Tab 3, p. 18

Preamble: ES7. Finding: Some measures (e.g. geothermal heat pumps, combined heat and power, and those that save district heating energy) have difficult to define baseline technologies.
Recommendation: Consider establishing a policy to define rules around energy savings calculation for fuel switching and district heating/cooling measures.
Outcome: Less evaluation risk and a better alignment between province energy efficiency goals and program implementation.
Union response: Union continues to adhere to DSM policies and guiding principles as defined in the 2015-2020 DSM Framework and Guidelines.

Question:

a. Please provide further clarification about what in the 2015-2020 DSM Framework is Union referring to about creating rules for energy saving calculations for fuel switching and district heating/cooling measures.
b. Does Union agree with the EC's potential outcome, and if not, why?

Response:

a) It is Union's understanding that the 2015-2020 DSM Framework does not provide any direction regarding supporting technologies related to fuel switching or to district heating/cooling. Union recommends that such direction should be given and a policy should be established.

b) Union agrees with the EC's potential outcome.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: General

Question: Please provide copies of all communications between Enbridge and Union relating to the positions taken in EB-2017-0323 and EB-2017-0324, including any co-ordination of those positions, any formal or informal agreements to support the positions of each other, and any agreements with respect to the provision of expert or other evidence.

Response:

Union confirms that it has had informal communications with EGD related to the positions taken in EB-2017-0323 and EB-2017-0324. Alignment between Union and EGD has been a product of the 2015-2020 DSM Framework, with 2015 being the first-ever OEB Staff-coordinated joint audit process through which the utilities were evaluated by one evaluator and governed by one process. Similarities in the utilities' positions reflect the joint nature of the new EM&V process. However, Union disputes the relevance to this proceeding of these informal communications.

Union also confirms that it worked with EGD to retain Navigant to undertake a jurisdictional NTG policy scan to provide perspective and insights around treatment of NTG studies in jurisdictions with similar performance-based DSM programming. No contractual agreement was entered into between Union and EGD with respect to this expert evidence.

Union also shared and sought EGD feedback on the Draft EAC Charter which was included in Union's application at Exhibit A, Tab 2, Appendix A.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 1, p. 3

Question: Please provide an enumerated list of the benefits and disbenefits of the change in EM&V process from the previous approach, used for 2014 and prior years, and the OEB staff-led process commencing in 2015.

Response:

As noted in Union's 2015-2020 DSM Plan, Union expected that the move to the OEB Staff coordinated EM&V process would improve the process by *"providing for regulatory efficiency and ensuring timelines are met while giving the Board and stakeholders confidence in the accuracy of results."*[1] These benefits were not achieved for the 2015 DSM EM&V process.

The EAC provides a single point forum where representatives can discuss evaluation projects and contribute to the development of evaluation studies. The EAC is comprised of members who collectively have knowledge and experience as summarized below (and in no particular order), which are considered benefits to the OEB Staff-led process commencing in 2015.

- Experience with Ontario's natural gas and DSM environment and Framework;
- Experience with OEB proceedings related to DSM;
- Experience with impact evaluation of DSM technologies and programs, natural gas energy efficiency technologies, multi-year impact assessments, NTG studies,; and,
- Detailed understanding of the utilities' DSM programs.

This breadth of member expertise and the unique level of collaboration allows a wide range of viewpoints to be considered.

Disbenefits of the OEB Staff coordinated EM&V process and EAC as noted in Union's application are summarized below (in no particular order).

- The EAC is not consensus based;
- The EAC is not consulted in EC and third party vendor selection processes;

[1] EB-2015-0029, Application, Exhibit A, Tab 2, p. 26

- There is a lack of transparency in cost accounting;

- There have been substantial delays that led to rate and regulatory instability and inefficiency for Union and its customers;

- There is a lack of transparency in communications and calculations;

- The Original Scope of Work (NTG) was not adhered to particularly in relation to NTG (Spillover, Secondary Attribution, application to 2015 DSM program results) and Timelines; and,

- CPSV was overly burdensome for customers:
    - Timelines went well beyond the previous process managed by Union,
    - CPSV on-site verification consultants did not have DSM verification experience,
    - CPSV results were not provided in live calculators in a transparent manner, and
    - CPSV results were not reviewed by an Ontario Professional Engineer.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 1, p. 5

Question: Please provide details of the "excessive project sampling relative to prior audits", and the reasons it arose. Please confirm that the project sampling was discussed at length with the EAC before being done.

Response:

A summary of the total amount of project sampling from 2012 to 2015 is provided below in Table 1 below:

Table 1

	2012	**2013**	**2014**	**2015**
Commercial & Industrial	29	21	24	110
Large Volume	17	8	8	77
Low Income	12	11	10	5
Total	**58**	**40**	**42**	**192**

Union believes the increase in sample size occurred because DNV GL decided to verify every project completed at each sample site, even though the additional projects were not a part of the original sample. It is important to note that the projects that were verified and not a part of the original sample ("Over-Sampled Projects"), represented themselves in the final analysis; whereas the sample projects represented and were given a weight according to the segment of the population that they were drawn from in order to calculate the realisation rates. As a result, the projects contained in the sample had a greater impact on the realisation rate, compared with the Over-Sampled Projects which were not weighted to reflect a portion of the population. Union believes the drawbacks of the over-sampling approach outweigh any benefits.

Union provided comments on the CPSV Proposal and Scope of Work, however, both of these documents indicated that fewer projects were expected in the sample (please see response at Exhibit B.Staff.16). It was never clear that 192 projects would be verified for the 2015 CPSV work until the results were received.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 1, Appendix A, p. 1

Question: Please describe, with details, the shortcomings of the previous audit committees, including the extent if any to which the results were either not effective or not thorough.

Response:

Union did not find the results of the previous audit process to be ineffective or otherwise deficient. As part of its 2015-2020 DSM Plan application Union expressed concern that the 2012-2014 audit process "*has not provided the Board and all Stakeholders confidence in the results or provided for timeliness and regulatory efficiency. The evaluation process should be designed with a focus on evaluation expertise and accuracy, not on advocacy*".[1] The concerns expressed by Union above regarding the 2012-2014 audit process persist under the new OEB coordinated EM&V process.

[1] EB-2015-0029, Application , Exhibit A, Tab 2, p. 27

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 1, Appendix A, p. 4

Question: Please provide a definition of the term "Secondary Attribution" used in the evidence.

Response:

As noted in Union's application at Exhibit A, Tab 2, p. 31, Lines 20 and 21, in the context of a DSM program, *"Secondary Attribution refers to the longer-term effect that a utility relationship with a participant has had on the participant's decision to participate"*.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 1

Question: Please provide details of the "customer complaints" referred to, and how they differed from customer complaints relating to the audit process in prior years. Please disaggregate changes in the level of customer complaints between those arising out of increased thoroughness of the 2015 audit, and those arising for other reasons.

Response:

Customer concerns presented and discussed with the EC and OEB Staff for the 2015 audit included:

- Verifiers booked site visits with as little as one day's notice to both customers and Union. Questions and projects being verified were also provided to customers on similar short notice and sometimes the lists of questions and projects to be verified were incomplete.

- The number of projects being verified at a customer site coupled with the level of detail that was being asked for each project was too much.

- Customers expressed concern that verification would happen without Union account managers in attendance.

Union has no record or recollection of such complaints for CPSV or the audit from customers prior to 2015. Union interprets the customer concerns to be related to verification pre-site visit preparation, program and/or project awareness, the level of time required (this pertains to "over-sampling"), and the repetitiveness of questions. To the best of Union's knowledge, Union is not aware of any customer complaints pertaining to the thoroughness of the 2015 audit, unless the time burden associated with longer site visits for oversampling is considered as a measure of thoroughness.

Please also see the response at Exhibit B.Staff.16.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, pp. 6-7, 25-26

Question: Please quantify each of the major causes of delays in the 2015 process, and identify the primary reason for each. For each of the audits for 2010 to 2014, please provide dates for each comparable step in those processes, including the involvement of the AC or TEC in each such step, and identify why they took more or less time than for the 2015 year.

Response:

Delays in the 2015 audit process are detailed in Exhibit A, Tab 2, pp. 25 and 26.

Dates for comparable steps for each of the 2010 to 2014 audits are summarized and compared against the 2015 audit process below in Table 1:

Table 1

Step	2010	2011	2012	2013	2014	2015
Audit/EC RFP Development	*Dec 2010* Union Reviewed with EAC	*Jan 2012* Union Reviewed with EAC	*Oct 2012* AC Review Scope of Work for Audit RFP	*Jan 2014* TEC created Audit RFP, AC review	*Nov 2014* TEC reviewed Audit RFP	*Nov 2015* OEB Staff Reviewed with EAC
Auditor/EC Selection[A]	*Feb 11, 2011* EAC Consensus	*Mar 2, 2012* EAC Selected	*Jan 2013* AC Consensus	*Mar 2014* AC Consensus	*Dec 2014* AC Consensus	*Apr 2016* No consultation (Expected Oct 1, 2015)
EM&V Plan[B]	*Mar 12, 2011* Presented to EAC	*Mar 26, 2012* Presented to EAC	*Feb 2013* Presented to AC	*Mar 2014* Presented to AC	*Jan 2015* Presented to AC	*Feb 2017* (Expected May 2016)
CPSV Scope of Work[B]	*Oct 2010*	*Sep 2011*	*Oct 2012* TEC Provided input into CPSV SoW	*Dec 2013* TEC Consensus	*Jan 2015* TEC Consensus	*Dec 2016* *No Consensus* (Expected May 2016)

Step	2010	2011	2012	2013	2014	2015
Custom Program Data Request	*Nov 2010/ Jan 2011* CI Waves 1,2 *Feb 2011* DC	*Nov 2011/ Jan 2012* CI Waves 1,2 *Feb 2012* DC	*Nov 2012/ Jan 2013* Waves 1,2	*Dec 2013*	*Jan 2015* for LI *Feb 2015* for CI and LV	*Nov 2016*
Field CPSV	*Nov 2010/ Jan 2011* CI Waves 1,2 *Feb/Mar 2011* DC	*Nov 2011/ Jan 2012* CI *Nov-Dec 2011 Jan-Feb 2012* DC Waves 1,2	*Nov/Dec 2012* Wave 1 *Jan-Mar 2013* Wave 2	*Jan-Mar 2014*	*Jan –Mar 2015*	*Jan – Mar 2017*
Tracking Database Request[C]	*Apr 11, 2011*	*May 7, 2012*	*Mar 2013*	*May 2014*	*Apr 2015*	*Jan 2017*
Draft EC Report	*May 16, 2011* Delivered to EAC	*May 16, 2012* Delivered to EAC	*Jun 2013* Delivered to AC	*Sep 2014* Delivered to AC	*Oct 5, 2015* Delivered to AC	*Jun 2017* Delivered to EAC
Final EC Report	*Jul 15, 2011* Delivered to EAC	*Jun 15, 2012* Delivered to EAC	*Aug 2013* Delivered to AC	*Sep 2014* Delivered to AC	*Oct 29, 2015* Delivered to AC	*Oct 2017/Dec 2017* Delivered to EAC

NOTES:

(A) Significant delays were seen in the EC selection process and the development of the EM&V plan. Since OEB Staff selected the EC without EAC input and did not provide the EAC with information on the delay, Union is not aware of the exact cause for it.

(B) The EM&V plan was an EC work product and the EAC did not receive information on the delay.

(C) The EAC did not receive information on why the tracking database request was delayed.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 7

Question: Please provide the empirical basis for the 46% custom program NTG adjustment factor, and file the research on which it is based, if any.

Response:

Union's 46% custom program NTG value is solely comprised of the Free Ridership portion of a primary research study conducted in 2008 (please see Exhibit B.Staff 5.Attachment F, pp. 25 - 158).

As noted in the study, the basis for the values is as follows:

> *Free ridership and spillover values were estimated using data from surveys with participants, non-participants, trade allies, and utility staff. This approach is based primarily on participant self-reported information along with other perspectives to triangulate the net-to-gross estimates.*
>
> *Experienced utility industry consultants conducted the interviews and most were done on-site at the participant's premise. To address the possibility of respondent bias, the interviews approached each topic from a variety of directions. The interviewer had the discretion to probe for supporting information and the analysis process checks for consistency across answers. Interviewees were promised confidentiality and assured that their answers will not affect the incentives or support they have received from the program. To address the possibility of interviewer bias, each interviewer was trained in the purpose of the research and the importance of objectively probing and recording responses. Four different interviewers performed the interviews and the data from their interviews were compared to look for uneven application of the methodology.*[1]

[1] Exhibit B.Staff 5.Attachment F, p.37

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 10

Question: Please describe the extent of discussions between the members of the EAC with respect to
i) how to apply the NTG study, and
ii) what spillover component should be used for 2015.

If there were disagreements between members of the EAC, please describe.

Response:

i) Discussions between members of the EAC on how to apply the NTG Study (which includes Spillover) focused on whether they should apply retroactively to 2015 results.

ii) The extent of discussions between members of the EAC on what Spillover component should be used related to whether adopting a value from another jurisdiction was reasonable without EAC consultation. These discussions occurred after a deemed value had already been applied to the 2015 results.

In the absence of EAC minutes, Union can only describe its own position. Union will not comment on behalf of other individual EAC members.

Union's disagreements relating to the referenced items are outlined in Union's application at Exhibit A, Tab 2, pp. 7-15 and include:

- The decision to apply NTG to 2015;
- The decision to apply a deemed Spillover rate without EAC consultation; and
- The decision to not apply Secondary Attribution.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 10

Question: Please describe in detail the steps taken by the Applicant, both in program design and program implementation, to minimize free riders in the custom C&I program.

Response:

In its decision on Union's 2015-2020 DSM Plan, the OEB directed the utilities at the Mid-Term Review to *"provide evidence showing how it has lowered the free-ridership rates in these [Commercial/Industrial Custom] programs"* and to *"provide evidence to either demonstrate the effectiveness of its screening efforts or identify the barriers to lowering the free-rider rate in commercial and industrial custom programs"*.[1]

In Union's October 2, 2017 DSM Mid-Term Review submission[2], Union provided information related to these directives which have been reproduced below for reference:

EFFORTS TO REDUCE FREE-RIDERSHIP
Union has enhanced several key program design and implementation practices within the Commercial/Industrial Custom offering in order to reduce free-rider participation. These enhancements include updated project eligibility requirements, improved project documentation and screening practices, the exclusion of routine maintenance projects, and the addition of terms and conditions to marketing materials. These enhancements are explained in further detail below.

Updated Project Eligibility Requirements
In an effort to reduce free-ridership in Union's Commercial/Industrial Custom offering, Union has updated its custom project eligibility requirements to ensure they exceed industry standard practices. An example of an industry standard practice used is one inch-thick (1") insulation for buried pipes within Union's greenhouse market. By updating its project eligibility requirements to exceed industry standard practice, buried pipes within Union's greenhouse market must now exceed one inch-thick insulation in order to qualify to receive a financial incentive through Union's Commercial/Industrial Custom offering. While not all customers will follow industry standard practice within their respective facilities, the likelihood a customer will do so without being provided a financial incentive is considered high. Therefore, by updating project eligibility requirements to exceed industry standard practices, free-ridership within the custom offering is

[1] EB-2015-0029, Decision, Section 5.2.6, p.21
[2] EB-2017-0127, Union DSM Mid-Term Review Part Two Requirement One Submission, Section 1.1, pp. 4-7

expected to decrease. Union will continue to assess market and industry standard practices and will update project eligibility requirements as appropriate to ensure they continue to exceed industry standard practices.

Improved Project Documentation and Project Screening Practices

In an effort to reduce free-ridership, Union has enhanced its custom project documentation form to capture more detailed information about each custom project in order to identify and screen-out projects with high free-ridership attributes. Please see Appendix A for the enhanced project documentation form. Specifically, the custom project documentation form now solicits information related to compliance requirements and manufacturer warranties. Projects that are considered compliance requirements (such as for safety or emissions purposes) or are eligible for manufacturer warranty should be completed by the customer without financial incentive. Improving the documentation form to capture more targeted and relevant information from participating customers allows Union to more effectively identify and screen-out projects with high free-ridership attributes.

Exclusion of Routine Maintenance Projects

In an effort to reduce free-ridership, beginning in 2016, Union stopped providing incentives for routine maintenance projects such as steam trap repairs, steam leak repairs and combustion tune-ups. Steam traps, for example, are devices used within commercial/industrial facilities to discharge condensate with minimal steam loss, and should be repaired or replaced soon after failure to prevent excessive steam loss and inefficient energy use. In an effort to reduce free-rider participation, routine maintenance projects such as steam trap repairs are no longer eligible for financial incentives within Union's Commercial/Industrial Custom offering, and savings from routine maintenance projects are not claimed towards the offering's results. To ensure customers are aware of the benefits of performing routine maintenance activities, Union continues to provide information and education about routine maintenance projects as part of the offering.

Addition of Terms and Conditions to Marketing Material

In an effort to reduce free-ridership, Union's marketing material for the Commercial/Industrial Custom offering now includes a Terms and Conditions section that informs program participants that the eligibility of all projects are subject to verification by Union. Please see Appendix B for Union's Terms and Conditions. The additional information is intended to inform customers that certain projects with high free-ridership attributes will not be accepted by Union. Union believes this helps limit the number of projects with high free-ridership elements from entering the project screening process.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 10

Question: Please describe in detail the steps taken by the Applicant, both in program design and program implementation, to maximize spillover from the custom C&I program.

Response:

Spillover effects refer to a value that reflects a customer's decision to adopt energy efficiency measures because they are influenced by a utility's program related information and marketing efforts, but do not actually participate in the program. Aside from the numerous components of Union's Custom offering[1] involving customer education, which are designed to increase awareness of energy efficiency opportunities and benefits, Union does not actively take steps to maximize Spillover of its custom C&I program.

[1] Exhibit B, Tab 1, pp. 41-45

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 18

Question: Please describe all instances in which OEB staff "directed" the EC to take material actions without consulting with the EAC.

Response:

Please see the response at Exhibit B.OSEA.1 d) & e).

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 18

Question: Please provide a copy of all communications between the Applicant and OEB Staff in or before March 2016 relating to the application of the NTG study.

Response:

Union has searched the records of the relevant staff to locate communications with OEB Staff in or before March 2016 relating to the application of the NTG Study, and has not located any such communications. Union has located the attached letter from Lynne Anderson (OEB Vice President, Applications) dated March 4, 2016, which addresses the Net-to-Gross Study (see Attachment A).

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Ontario

MEMORANDUM

BY EMAIL

March 4, 2016

To: **Enbridge Distribution Inc.**
Union Gas Limited
Technical Evaluation Committee (TEC)
Evaluation Advisory Committee (EAC)

Re: **Transition of Technical Evaluation Committee Activities to the OEB**
EB-2015-0245

The purpose of this memorandum is to map out the transition of the current demand-side management (DSM) evaluation activities from the TEC to the OEB.

Background

As described in the OEB's August 21, 2015 letter regarding the 2015-2020 DSM evaluation process, the TEC's evaluation activities will be transitioned to the OEB under the new DSM evaluation governance structure. In that letter, the OEB directed the gas utilities and the TEC to continue working on the evaluation projects that they had initiated until the transition takes place. The current status of each of the Projects is as follows:

1) *Technical Reference Manual (TRM) Development*: The TEC selected two vendors to complete the TRM: Energy & Resource Solutions (ERS) and MindTouch, Inc. ERS was procured to complete the first phase of the project (development of the TRM with updated measures and input assumptions). This project is mostly completed. MindTouch was procured to complete the second phase (online platform of TRM) of the project.

2) *Net-to-Gross Study:* The Custom Commercial and Industrial Net-to-Gross Study will update the current net-to-gross rates used to estimate the impact of custom projects. The utilities, with the endorsement of the TEC, managed the procurement process and contracted DNV KEMA (now DNV GL) in May 2015 to undertake the study. DNV GL is in the process of developing a detailed Work Plan.

3) *Boiler Baseline Study:* As part of separate OEB Decisions issued in 2015 (February 26, 2015[1] and June 4, 2015[2]), Union and Enbridge were directed to complete a Boiler Baseline Study in 2015, with the findings incorporated in the evaluation of 2014 results. The TEC developed a study scope of work and issued a Request for Proposals (RFP) for this study in October 2015. In response to the RFP, consultants have submitted proposals to the TEC. The TEC has not proceeded with the evaluation of the proposals as it is awaiting further instructions from the OEB.

4) *Persistence Study*: The TEC conducted initial research into the scope of work for a persistence study in 2015. This study has not been initiated.

Transitioning to the OEB

The transition plan for each study is outlined below.

1) *Technical Reference Manual (TRM) Development*

Development of the TRM with updated measures and input assumptions is mostly completed and the TEC will continue to finalize the TRM with ERS. The management of the online portion of the TRM has been transitioned to OEB Staff, who will post the final TRM online when it is available. The utilities will continue to manage any remaining contractual obligations and payments related to the TRM.

2) *Net-to-Gross Study*

DNV GL plans to present the draft work plan for the net-to-gross study at the next TEC meeting, currently scheduled for March 10, 2016. Following input from the TEC, this

1 EB-2014-0277 – Enbridge Gas Distribution Inc.
2 EB-2014-0273 – Union Gas Limited

study will be transitioned to OEB. The utilities will continue to manage contractual obligations and payments associated with this project. OEB Staff will assume oversight of the study and will confirm the completion of major milestones for the utilities to process payments of consultant's invoices.

Though OEB Staff will have oversight going forward for the TRM and Net-to-Gross Study as noted above, the gas utilities will incur the costs to complete these studies and therefore can seek recovery of these costs as part of the DSM program.

3) Boiler Baseline Study

This study was the result of OEB decisions for both Enbridge and Union Gas and therefore the utilities are expected to complete it. Once the proposals have been evaluated and the consultant selected for the Boiler Baseline Study, in order to transition to the new framework, input on the study will be provided to the utilities by the EAC and OEB Staff instead of the TEC.

4) Persistence Study

OEB Staff will be responsible for the procurement process and management of the Persistence Study, including management of project deliverables and contractual obligations through to completion of the study, with input from the EAC.

If you have any questions regarding the transition process, please contact Takis Plagiannakos at takis.plagiannakos@ontarioenergyboard.ca or 416-440-7680.

Yours truly,

Original Signed by

Lynne Anderson
Vice President, Applications

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 19

Question: Please confirm that both the utilities complained about the delay in getting a spillover number for 2015.

Response:

Confirmed for Union.

Following the completion of the Free Rider component of the NTG study, Union also expressed concern that OEB Staff directed the EC to mark its NTG report as "Final" and made the report publically available despite the fact that the Spillover component was delayed and not included in the report.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 20

Question: Please file the draft Spillover study presented to the EAC in 2018.

Response:

This study is being coordinated and managed by OEB Staff and is in draft form. Given that the study has not yet been finalized or approved and is not being coordinated by Union, Union is not in a position to produce it absent direction from the Board.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 21

Question: Please identify all contacts relating to EC selection between OEB Staff and EAC members, including the two utilities, prior to the selection of the EC by OEB Staff. Please file copies of all objections to the selection of DNV GL by either of the utilities prior to or within three months of the DNV GL selection as EC.

Response:

Union has searched its records for communications relating to EC selection exchanged between OEB Staff and EAC members prior to the selection of the EC by OEB Staff, and has not located any responsive communications. Union was not provided the opportunity to review any proposals nor participate or provide input into the selection process. Union neither voiced a preference for, nor an objection to, the selection of DNV GL as EC.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 24

Question: Please file all communications between the Applicant and OEB Staff with respect to EM&V budgets and forecasts.

Response:

Union's records of the written communications between Union and OEB Staff with respect to EM&V budgets and forecasts occurred along five email threads. These threads have been summarized below and are arranged in chronological order:

- 2016 and YTD February 2017 Evaluation Accruals (Attachment A)
- July OEB Invoice Details, 2016 Accrual Update and Budgets/Forecasts for 2015 Evaluation (Attachment B)
- NTG Study Costs (Attachment C)
- October OEB Invoice Details, 2016 Accrual and 2015 Evaluation Spend Updates (Attachment D)
- 2017 Year-End Accruals (Attachment E)

Several verbal conversations also occurred on the subject of budgets, accruals and forecasts through scheduled EAC meetings as well as phone conversations directly with OEB Staff.

2016 and YTD February 2017 Evaluation Accruals

From: Kulperger, Leslie
Sent: February-28-17 3:31 PM
To: Josh Wasylyk
Cc: Buan, Eric; Dunlop, Erin; Barlow, Nada
Subject: RE: DSM Evaluation Accruals (2016 - YTD 2017)

Thanks Josh –this does help!

From: Josh Wasylyk [mailto:Josh.Wasylyk@ontarioenergyboard.ca]
Sent: February 28, 2017 3:28 PM
To: Kulperger, Leslie
Cc: Buan, Eric; Dunlop, Erin; Barlow, Nada
Subject: RE: DSM Evaluation Accruals (2016 - YTD 2017)

Hi Leslie,

EAC costs are based on hours worked. We will likely settle EAC costs over the next 4-6 weeks. The totality of accruals (EAC and DNV GL costs) should be settled by mid-May.

Hope that helps.

Josh Wasylyk
T: 416 440 7723

From: Kulperger, Leslie
Sent: February-28-17 3:26 PM
To: Josh Wasylyk; Tamara Kuiken Whitiken (DNV-GL)
Cc: Buan, Eric; Dunlop, Erin
Subject: RE: DSM Evaluation Accruals (2016 - YTD 2017)

Thanks Josh – we'll follow up with Tammy directly on the NTG work/accruals.

From: Kulperger, Leslie [mailto:LKulperger@uniongas.com]
Sent: February 28, 2017 3:25 PM
To: Josh Wasylyk
Cc: Buan, Eric; Dunlop, Erin; Barlow, Nada
Subject: RE: DSM Evaluation Accruals (2016 - YTD 2017)

Hi Josh,
Thanks for getting back to me so quickly on this. Would you mind clarifying whether the EAC costs are based on hours worked or if you have been invoiced? Also, do you have any sense of when we might expect invoices to balance out the accruals?
Thanks again,

Leslie

From: Josh Wasylyk [mailto:Josh.Wasylyk@ontarioenergyboard.ca]
Sent: February 28, 2017 2:55 PM
To: Kulperger, Leslie; Tamara Kuiken Whitiken (DNV-GL)
Cc: Buan, Eric; Dunlop, Erin
Subject: RE: DSM Evaluation Accruals (2016 - YTD 2017)

Thanks, Leslie. I've updated the EAC costs for 2017. The OEB will invoice the gas utilities for all DSM related costs (inclusive of DNV GL's Evaluation Contractor costs and EAC costs). DNV GL will invoice the gas utilities directly for NTG-specific work.

Tammy – as the Enbridge Inc.-Spectra acquisition is now official, Union needs to do some book keeping to help with the transition. Can you please provide 2017 accruals from January 1 – Feb 28th for the items listed below under DNV GL Costs – Union Portion? This is a follow-up to the accrual summary you provided for Tina late in 2016.

Thanks a lot,
Josh

Josh Wasylyk
T: 416 440 7723

From: Kulperger, Leslie [mailto:LKulperger@uniongas.com]
Sent: February 27, 2017 4:48 PM
To: Josh Wasylyk
Cc: Buan, Eric; Dunlop, Erin
Subject: FW: DSM Evaluation Accruals (2016 - YTD 2017)

Hi Josh,
Further to our chat, I would appreciate some insights with respect to amounts accrued for 2016 and any work-to-date amounts we should accrue for Jan/Feb 2017. I am forwarding the email thread that relates to end-of-year accruals for reference. I'm not really clear (I apologize) on whether the Board will be billing us or if invoices will come directly from DNV and EAC? I see DNV provided some of the information…

Here is what I have:

	Outstanding Accrual Amts 2016	2017 (Jan/Feb) for Accrual
EAC Costs – Union Portion	$15,880.12	$5,593.50
DNV GL Costs - Union Portion		
Resource Acquisition - Res	$11,899.52	
Resource Acquisition - C&I	$120,577.62	
Performance-Based	$400.80	
Low Income	$19,832.53	
Large Volume	$37,681.80	
Market Transformation	$7,933.01	
Total	$198,325.29	
Total Accrual from Board Staff	**$214,205.41**	

Thank you for any help/guidance you can provide!
Leslie

Leslie Kulperger
Manager, DSM Research & Evaluation
-
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From: Kuiken Whitiken, Tamara [mailto:Tamara.Kuiken@dnvgl.com]
Sent: December 9, 2016 5:02 PM
To: Nicholson, Tina; Josh Wasylyk
Cc: Buan, Eric
Subject: RE: DSM Evaluation Accruals (2016)

Sorry for the error; Tina, thanks for calling me so quickly.

Question 1, adding up to the correct total. To get this number from the Union number in Josh's email, I applied the ratio of DNV GL costs to overall costs to the Union utility share.

Resource Acquisition - Res	11899.52
Resource Acquisition - C&I	120577.62
Performance-Based	400.80
Low Income	19832.53
Large Volume	37681.80
Market Transformation	7933.01
SUM	198325.29

Question 2 with CAD instead of USD. I used an exchange rate of 0.82 CAD/USD.

M#	Milestone	Incremental Total (CAD)	% as of May 31, 2016	% as of Dec 12, 2016	Total as of May (CAD)	Union as of May (CAD)	Enbridge as of May (CAD)
2	SOW and IDI	$80,244	70%	100%	$56,171	$28,085	$28,085
3	Method Memo	$171,951	20%	100%	$34,390	$17,195	$17,195
	Total	$252,195			$90,561	$45,280	$45,280

Best regards
for KEMA Inc., USA

Tamara Kuiken, P.E.
Head of Section, Engineering Central, Sustainable Energy Use
DNV GL - Energy

E-mail tamara.kuiken@dnvgl.com
Mobile +1 608 466 0400 | Direct +1 608 259 9152,,,,,70206
www.dnvgl.com | LinkedIn

From: Kuiken Whitiken, Tamara
Sent: Friday, December 09, 2016 3:39 PM
To: 'Nicholson, Tina'; Josh Wasylyk
Cc: Buan, Eric
Subject: RE: DSM Evaluation Accruals (2016)

Tina and Josh,

Here is my result. Sorry this is so late; please email or call ASAP if you have any concerns. I'm here until 5 CT. Tammy

Question #1

Resource Acquisition - Res	$ 29,689.38
Resource Acquisition - C&I	$ 300,842.03
Performance-Based	$ 1,000.00
Low Income	$ 49,482.30
Large Volume	$ 94,016.37
Market Transformation	$ 19,792.92
SUM	$ 494,823.00

Question #2

M#	Milestone	Incremental Total (CAD)	% as of May 31, 2016	% as of Dec 12, 2016	Total as of May (CAD)	Union as of May (CAD)	Enbridge as of May (CAD)
2	SOW and IDI	$65,800	70%	100%	$46,060	$23,030	$23,030
3	Method Memo	$141,000	20%	100%	$28,200	$14,100	$14,100
	Total	$206,800			$74,260	$37,130	$37,130

Best regards
for KEMA Inc., USA

Tamara Kuiken, P.E.
Head of Section, Engineering Central, Sustainable Energy Use
DNV GL - Energy

E-mail tamara.kuiken@dnvgl.com
Mobile +1 608 466 0400 | Direct +1 608 259 9152,,,,,70206
www.dnvgl.com | LinkedIn

From: Nicholson, Tina [mailto:tnicholson@uniongas.com]
Sent: Friday, December 09, 2016 12:12 PM
To: Josh Wasylyk; Kuiken Whitiken, Tamara
Cc: Buan, Eric
Subject: RE: DSM Evaluation Accruals (2016)

Hello Josh & Tammy,

Thank you for looking into accruals for Union.

1. The evaluation cost breakouts below are exactly how we track our expenses. As for the NTG Study and the EM&V plan we would accrue these items at the portfolio level, so please provide a number for these as well.
2. NTG costs for work up to end of May 2016 – thanks for being able to provide this information Tammy.

Best,
Tina

From: Josh Wasylyk [mailto:Josh.Wasylyk@ontarioenergyboard.ca]
Sent: December 9, 2016 12:40 PM
To: Tamara Kuiken Whitiken (DNV-GL)
Cc: Nicholson, Tina; Buan, Eric
Subject: DSM Evaluation Accruals (2016)

Hi Tammy,

I thought it best I include Tina and Eric on this email to ensure they get what they need before the end of the day.

1) Evaluation Costs Breakout

I have an email to Tina to confirm the manner in which Union needs the evaluation costs broken down.

Unless Tina provides different direction, please proceed by breaking out the evaluation costs you provided to me (see email below) in the manner below as these areas are those which have evaluation costs associated with them in the OEB's 2015-2020 DSM Decision.

Resource Acquisition – Residential
Resource Acquisition – C&I
Performance-Based
Low-Income
Large Volume
Market Transformation

Tina, please let Tammy know if you are looking for something different.

2) NTG Costs up to end of May 2016

Tina - Tammy will also be able to provide a NTG cost estimate up to the end of May 2016 for Union's accrual purposes.

Tammy knows that both of these items are needed before the end of day today.

I am heading over to the OEB holiday function. I will have my phone on me and will check emails to keep this moving. If I'm needed back in the office, our party is being held just down the street from our office, so I can scoot back if necessary.

Josh

Josh Wasylyk | Project Advisor| Ontario Energy Board
2300 Yonge Street, 27th Floor |Toronto, ON | M4P 1E4 | Ph: 416 440 7723

From: Josh Wasylyk
Sent: November 22, 2016 2:11 PM
To: Tina Nicholson; Deborah Bullock (Deborah.Bullock@enbridge.com)
Cc: Pascale Duguay
Subject: OEB DSM Evaluation Accruals (2016)

Hi Tina and Deborah,

As requested, here is the accrual information related to the OEB's 2016 DSM evaluation costs.

	2016 Accrual Amount
DNV GL Costs	$494,823
EAC Costs	$39,621
TOTAL	**$534,443**

Based on the OEB's cost assessment model, the apportionment to the utilities would be:

	Utility Share
Enbridge	$319,009
Union	$214,205
NRG	$1,229

Tammy indicated that DNV GL will be sending invoices to the utilities directly in relation to the NTG work.

If you have any questions or would like to discuss, please let me know.

Josh

Josh Wasylyk | Project Advisor| Ontario Energy Board
2300 Yonge Street, 27th Floor |Toronto, ON | M4P 1E4 | Ph: 416 440 7723

July OEB Invoice Details, 2016 Accrual Update and Budgets/Forecasts for 2015 Evaluation

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From: Valerie Bennett [mailto:Valerie.Bennett@oeb.ca]
Sent: September 25, 2017 3:39 PM
To: Erin Dunlop
Cc: Leslie Kulperger; Eric Buan
Subject: RE: [External] RE: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Erin –

Sorry for the delay! Please see below for responses to your questions.

Thanks,

Valerie

Valerie Bennett, P. Eng, CMVP
Project Advisor – Application Policy & Climate Change
Ontario Energy Board
2300 Yonge St.
Toronto, ON M4P 1E4
Tel.: 416 440-7747
Fax: 416 440-7656
E-mail: **NEW!** valerie.bennett@oeb.ca

From: Erin Dunlop [mailto:EDunlop@uniongas.com]
Sent: Thursday, September 21, 2017 3:41 PM
To: Valerie Bennett <Valerie.Bennett@oeb.ca>
Cc: Leslie Kulperger <LKulperger@uniongas.com>; Eric Buan <EBuan@uniongas.com>
Subject: RE: [External] RE: OEB Invoice Details re: Evaluation EB-2015-0245

Sounds good. I'll wait to hear from you next week.

Thanks,
Erin

Erin Dunlop
Senior DSM Program Evaluator
–
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2901, 777 Bay Street Toronto, ON M5G 2C8

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From: Valerie Bennett [mailto:Valerie.Bennett@oeb.ca]
Sent: September-19-17 6:37 PM
To: Erin Dunlop
Cc: Leslie Kulperger; Eric Buan
Subject: [External] RE: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Erin –

I've gathered the relevant documents but won't have a chance to dig into them this week unfortunately. Can I get back to you early next week?

Thanks,

Valerie

Valerie Bennett, P. Eng, CMVP
Project Advisor – Application Policy & Climate Change
Ontario Energy Board
2300 Yonge St.
Toronto, ON M4P 1E4
Tel.: 416 440-7747
Fax: 416 440-7656
E-mail: **NEW!** valerie.bennett@oeb.ca

From: Erin Dunlop [mailto:EDunlop@uniongas.com]
Sent: September-19-17 12:34 PM
To: Valerie Bennett
Cc: Leslie Kulperger; Eric Buan
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Valerie –

Did you have a chance to look into this?

Also, can you provide an estimate of costs for work incurred but not billed to Union up until the end of Sept? Since Sept will be the end of a Quarter, it is even more important that we accrue if needed to ensure corporate financial statements are correct.

Thanks,
Erin

From: Erin Dunlop
Sent: August-23-17 12:36 PM
To: 'Valerie Bennett'
Cc: Leslie Kulperger; Eric Buan
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245

Absolutely. That will give us the info we need to make sure all of our reporting is correct for month end. Side note – where did summer go? I can't believe we're coming up on the end of August. ☺

Thanks,
Erin

From: Valerie Bennett [mailto:Valerie.Bennett@oeb.ca]
Sent: August-23-17 10:52 AM
To: Erin Dunlop
Cc: Leslie Kulperger; Eric Buan
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Erin –

I'll look into this but I'm still getting up to speed on the costing stuff so I might not be able to get back to you until next week. Does that work?

Valerie

Valerie Bennett, P. Eng, CMVP
Project Advisor – Application Policy & Climate Change
Ontario Energy Board
2300 Yonge St.
Toronto, ON M4P 1E4
Tel.: 416 440-7747
Fax: 416 440-7656
E-mail: **NEW!** valerie.bennett@oeb.ca

From: Erin Dunlop [mailto:EDunlop@uniongas.com]
Sent: August-22-17 5:23 PM
To: Valerie Bennett
Cc: Leslie Kulperger; Eric Buan
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Valerie –

The information Josh has pulled together here is definitely helpful and informative. I do have a few follow-up questions/items to make sure that I'm interpreting this correctly.

1) Based on what is shown below, it looks like we over-accrued in 2016, i.e. we accrued nearly $200k at the end of 2016 and yet this shows 2016 actual costs were only $75k for Union. Is this correct?

VB: Yes this appears to be the case. This is likely lower because some DNV GL invoices came in late and we can't bill for them until we receive them.

2) Can you confirm that NTG costs are not in these numbers? Based on the footnote, I don't believe they are.

VB: Confirmed. We don't see the NTG costs at all given that the contract is with the utilities.

3) Could you provide a little more information on the invoice we have paid (the $123k), including:
   - a breakdown of the invoice by program like Josh has done for the overall costs? For example, if total CPSV cost is $224k, I believe that makes UG portion $89,600. How is that allocated to each program?

VB: Total CPSV cost was more than $224k; this only accounted for a portion of the work completed before April 1 that OEB received an invoice from DNV GL for (scope of work, survey development, methodology memo), along with an EC invoice for the same time period, and meeting costs. These were split between UG, EGD, and NRG according to the same ratios as cost awards (about 40% of was allocated to Union), like you pointed out. Neither OEB nor DNV GL did an allocation of these costs by specific program, but if Union wanted to do this, it could be done based on # of TSERS/interviews completed by program, or by relative program budget, or amount of savings per program, etc.

   - Are EC costs for portfolio wide activities, i.e. there is no specific program breakdown for these?

VB: Yes, they are portfolio-wide with no breakdown by program.

   - What period does this invoice cover then? Is it everything up until April?

VB: This Union invoice is for work that was completed until April 1 that had been invoiced by DNV GL by the time we sent it. Note that we are still waiting for invoices from DNV GL for some of the work during that period that will be billed to the utilities next time.

4) Am I understanding correctly that we have a remaining $272,494 (not including EAC costs) projected to be spent to finish the 2015 audit? We would then have some costs related to any work for 2016 and 2017 audit that would kick off in this year as well – the actual amount of which is still being finalized?

VB: Correct.

I appreciate your help in clarifying some of this information.
Erin

Erin Dunlop
Senior DSM Program Evaluator
–
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From: Josh Wasylyk [mailto:Josh.Wasylyk@oeb.ca]
Sent: August-11-17 4:18 PM
To: Erin Dunlop
Cc: Valerie Bennett; Leslie Kulperger; Eric Buan; Deborah Bullock
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Erin,

Sorry it's taken so long for me to get back to you. I've put together some cost information which I hope you find helpful.

The cost information is related to the 2015 evaluation work conducted in 2016 and 2017. Upcoming 2017 costs related to the pending 2016 evaluation work has not been included. As we don't have any bids or finalized budget amounts I was not comfortable including those at this time. Once the procurement process is complete and we have consultants in place, we will be in a better position to include projected 2017 costs related to 2016 evaluation work, inclusive of both DNV GL's EC work as well as any additional consultants brought on to undertake the four pending projects (CPSV/NTG, Residential Home, C&I Prescriptive and Custom Measure Life Review).

With respect to EAC costs, I have summarized what has been paid to date. We are planning on initiating the next EAC cost process shortly. This will cover the time period from April 1, 2017 to August 31, 2017. My expectation is that costs for this period will be approximately $100,000.

With respect to your question related to invoice CA1718Q2002, the total cost of $306,840.02 was made up of 99% DNV GL costs (broken up into EC costs of $81,624 and CPSV costs of $224,000). The remaining costs would be administrative in nature, likely for EAC conference call costs.

Here are some tables that break the costs related to the 2015 evaluation down in a few different ways.

- 2016 and 2017 total costs, including paid-to-date and remaining balances owed
- Total evaluation costs broken down for each utility by year and by program
- EAC costs to date

	2016	2017			
	Actual	Projected	Total	Paid to date	Remaining
Enbridge	$ 111,634	$ 476,506	$ 588,140	$ 182,458	$ 405,682
Union	$ 74,983	$ 320,065	$ 395,049	$ 122,555	$ 272,494
NRG	$ 374	$ 1,596	$ 1,970	$ 611	$ 1,359

Notes:

Costs are related to DNV GL in its role as the Evaluation Contractor and its role in conducting 2015 CPSV

Costs do not include EAC costs

Union	2016 Costs	2017 Costs
Resource Acquisition - Res	$ 23,860	$ 65,781
Resource Acquisition - C&I	$ 27,267	$ 131,882
Performance-Based	$ -	$ -
Low Income	$ 10,913	$ 41,391
Large Volume	$ 6,118	$ 62,232
Market Transformation	$ 6,825	$ 18,780
TOTAL	**$ 74,984**	**$ 320,065**

Enbridge	2016 Costs	2017 Costs
Resource Acquisition - Res	$ 31,473	$ 86,774
Resource Acquisition - Comm	$ 21,299	$ 126,251
Resource Acquisition - Ind	$ 22,313	$ 145,917
Low Income	$ 16,238	$ 61,627
Residential SBD	$ 6,097	$ 16,781
Commercial SBD	$ 3,046	$ 8,391
Home Labelling	$ 1,015	$ 2,797
Run-it-Right	$ 10,153	$ 27,969
TOTAL	**$ 111,634**	**$ 476,507**

EAC Costs	Sept. 29, 2016 D&O	June 5, 2017 D&O
Enbridge	$ 13,242.22	$ 40,171.50
Union	$ 8,891.74	$ 26,975.46
NRG	$ 51.12	$ 158.18
Total	**$ 22,185.08**	**$ 67,305.15**

While I am away, Valerie will be able to keep you apprised for future cost amounts.

Josh

Josh Wasylyk
T: 416 440 7723

From: Josh Wasylyk [mailto:Josh.Wasylyk@oeb.ca]
Sent: August-09-17 1:56 PM
To: Leslie Kulperger
Cc: Valerie Bennett; Eric Buan; Deborah Bullock; Erin Dunlop; Nada Barlow
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Leslie – yes, I will have financials sent around before the end of the week. I'm working on being able to provide a full breakdown of costs as requested by Erin.

Josh Wasylyk
T: 416 440 7723

From: Leslie Kulperger [mailto:LKulperger@uniongas.com]
Sent: August 9, 2017 11:14 AM
To: Josh Wasylyk
Cc: Valerie Bennett; Eric Buan; Deborah Bullock; Erin Dunlop; Nada Barlow
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245
Importance: High

Hi Josh,
I know you're probably very busy getting ready for your paternity leave… any chance you have been able to pull together the financial details that we requested before you leave?
Thank you,
Leslie

From: Dunlop, Erin
Sent: July-27-17 4:29 PM
To: Josh Wasylyk
Cc: Valerie Bennett; Kulperger, Leslie; Buan, Eric; Deborah Bullock
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245

Thanks, Josh.

Having the additional information you've mentioned would absolutely be helpful to us. As would any details on what is forecasted to be spent for the rest of 2017.

--Erin

From: Josh Wasylyk [mailto:Josh.Wasylyk@oeb.ca]
Sent: July-27-17 3:48 PM
To: Dunlop, Erin
Cc: Valerie Bennett; Kulperger, Leslie; Buan, Eric; Deborah Bullock
Subject: RE: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Erin,

Thanks for this. I've been working on some cost information but receiving your email is very helpful as I was guessing a bit as to what it was you were hoping to see. Now that I have some more information, I can do a better job on working to provide the utilities the most helpful data.

I'll need to go back to my worksheets and discuss with Tammy to ensure that things are itemized appropriately. I'll do my best to have the more itemized cost information to both Union and Enbridge next week.

Please let me know if having any of the information below, in addition to the accrued amounts, would be helpful:

- the invoiced/paid amounts
- EAC costs
- Projected 2018 costs – aggregated

Thanks,
Josh

Josh Wasylyk
T: 416 440 7723

From: Dunlop, Erin [mailto:EDunlop@uniongas.com]
Sent: July 27, 2017 3:40 PM
To: Josh Wasylyk
Cc: Valerie Bennett; Kulperger, Leslie; Buan, Eric
Subject: OEB Invoice Details re: Evaluation EB-2015-0245

Hi Josh –

I don't believe we've had the opportunity to meet or work together yet but I'm also on the Evaluation team here at Union and, among other things, I handle reporting matters, including financials. I understand from Leslie and Eric that you will be providing budget information related to the EC and audit. As part of that, could we also get details on the recent OEB invoice (CA1718Q2002)? This invoice had the following OEB charges related to EB-2015-0245:
OEB's cost after April 1, 2017: $135.70
OEB's cost before April 1, 2017: $122,843.77
The total variable costs are listed as $306,840.02, and the above charges would be Union's portion.

We would like an itemization/break down on what these costs are for. Is it CPSV activities (verification work), auditor costs (report preparation, other audit activities), other? What is the allocation by program? This will allow us to account for this spend correctly.

We also need help in reconciling this with the amount accrued in 2016. Based on the description, these should be costs up until April (maybe even up to the issuance of the invoice – July 1) and yet it is less than what we accrued for work that would have occurred in 2016. We accrued $198,325 for what we understood to be Union's portion of DNV GL EC/auditor costs performed but unbilled as of Dec 2016.

The total DNV GL 2016 accrual was around $495k, Union's portion is itemized below. You had provided the total amount and then Tammy from DNV GL further provided the break down by program.

Program	Amount Accrued for 2016
Resource Acquisition - Res	$11,899.52
Resource Acquisition - C&I	$120,577.62
Performance-Based	$400.80
Low Income	$19,832.53
Large Volume	$37,681.80
Market Transformation	$7,933.01
SUM	$198,325.29

Thank you,

Erin Dunlop
Senior DSM Program Evaluator
–
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Net-to-Gross Study Costs

From: Kulperger, Leslie
Sent: August-04-17 12:32 PM
To: Jones, Benjamin; Josh Wasylyk
Cc: Valerie Bennett; Buan, Eric; Deborah Bullock; Kuiken Whitiken, Tamara; Dunlop, Erin
Subject: RE: OEB Invoice Details - & How much is NTG??

Thanks for confirming, Ben.

We have agreed to work with ½ the full contract amount ($405,778)

Leslie

From: Jones, Benjamin [mailto:Ben.Jones@dnvgl.com]
Sent: August 4, 2017 12:30 PM
To: Kulperger, Leslie; Josh Wasylyk; Dunlop, Erin
Cc: Valerie Bennett; Buan, Eric; Deborah Bullock; Kuiken Whitiken, Tamara
Subject: RE: OEB Invoice Details - & How much is NTG??

Those numbers are correct. If signing authority is based on amount responsible, rather than total contract, for Union the amount would be half of the 374,778 USD ($187,389). Enbridge is $187,389 +31,000 = 218,389USD.

Thanks,
Ben

Best regards
for KEMA Inc., USA

Ben Jones
Senior Consultant, Policy Advisory and Research, Sustainable Energy Use
DNV GL - Energy

E-mail ben.jones@dnvgl.com
Direct +1 608 259 9152,,,,,70232
www.dnvgl.com | LinkedIn

From: Kulperger, Leslie [mailto:LKulperger@uniongas.com]
Sent: Friday, August 04, 2017 11:12 AM
To: Josh Wasylyk <Josh.Wasylyk@oeb.ca>; Dunlop, Erin <EDunlop@uniongas.com>
Cc: Valerie Bennett <Valerie.Bennett@oeb.ca>; Buan, Eric <EBuan@uniongas.com>; Deborah Bullock <Deborah.Bullock@enbridge.com>; Kuiken Whitiken, Tamara <Tamara.Kuiken@dnvgl.com>; Jones, Benjamin <Ben.Jones@dnvgl.com>
Subject: RE: OEB Invoice Details - & How much is NTG??

Thanks Josh – and sorry for the miss. I see this now.

From: Josh Wasylyk [mailto:Josh.Wasylyk@oeb.ca]
Sent: August 4, 2017 12:01 PM
To: Kulperger, Leslie; Dunlop, Erin
Cc: Valerie Bennett; Buan, Eric; Deborah Bullock; Tamara Kuiken Whitiken (DNV-GL); Jones, Benjamin (Ben.Jones@dnvgl.com)
Subject: RE: OEB Invoice Details - & How much is NTG??
Attachments: NTG Revival Agreement_DNV_OEB_EGD_UGL.PDF
FW NTG study contract.msg

Hi Leslie,

From the initial revival agreement that was circulated a little while ago, it appears the contract value is as follows:

$374,778 (NTG + expenses. See attached PDF)
$31,000 (Run-it-Right add on. See attached email chain)
$405,778 USD total

I suggest confirming this total with both EGD and DNV GL since the OEB was not party to the initial agreement which contained the contract value. I've copied Tammy and Ben so they can respond directly.

With respect to the initial budget information request, we are still working on it and hoping to have something for you before the end of today.

Josh

Josh Wasylyk
T: 416 440 7723

From: Kulperger, Leslie [mailto:LKulperger@uniongas.com]
Sent: August 4, 2017 11:44 AM
To: Josh Wasylyk; Dunlop, Erin
Cc: Valerie Bennett; Buan, Eric; Deborah Bullock
Subject: RE: OEB Invoice Details - & How much is NTG??
Importance: High

Hi Josh,
Just following up on this. Also, can you please tell me with the NTG contract is worth? In order to execute, we will need the correct signing authority. (I may give you a quick call on this because we would like to execute asap now that we have finally ironed out the contract issues.)
Thank you,
Leslie

October OEB Invoice Details, 2016 Accrual and 2015 Evaluation Spend Updates

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From: Erin Dunlop
Sent: November-06-17 9:48 AM
To: Valerie Bennett (Valerie.Bennett@oeb.ca)
Cc: Eric Buan; Leslie Kulperger
Subject: Evaluation Invoice Details and Budget Info

Hi Valerie –

Eric mentioned that we would like to talk a bit about invoicing in our touchpoint this afternoon. I thought I'd send along a couple of things we're looking for clarity on.

On the most recent invoice, there were two line items: costs before April 1st in the amount of $117k and costs after April 1st for $85k.

Based on our chat prior to this, I'm assuming the first is for work performed in 2016. Correct? Is a portion of that also work done Jan to April? We're trying to match up the overall accrual amounts and when work was done.

Now that 2015 audit is complete, when will all invoices be submitted for this work and do you know the total expected amount? The one cost is for after April 1st and the invoice date is Oct.4th but based on the other charge, this likely does not represent all work performed up until Oct.

Can you provide details on what the amounts represent? As in, what is it for – CPSV? Report preparation? Meetings? General auditor costs? If this is itemized on the invoice itself, could you forward a copy?

What is the proposed budget for the entire 2016 audit? What is the projected spend for the rest of this year related to 2016 audit?

Thanks,
Erin

Erin Dunlop
Senior DSM Program Evaluator
–
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2017 Year-End Accruals

From: Valerie Bennett [mailto:Valerie.Bennett@oeb.ca]
Sent: December-27-17 11:31 AM
To: Deborah Bullock
Cc: Erin Dunlop
Subject: [External] RE: OEB DSM Evaluation Accruals (2016)
Attachments: Rest_of_2017_accruals_dec27.xlsx

Hi Deb –

I've done a very quick calculation for Nov/Dec EAC costs based on the feedback we received from EAC members on the hours I provided them, times their hourly rates. Note that this is probably an upper limit since I don't expect all the experts to bill to the maximums. I've attached an update to the accruals excel for your reference too, with the details.

I'm ccing Erin here too so she has the estimate for reference.

DNV GL Costs	$	254,668
EAC Costs (estimated based on maximums)	$	45,375
Total	$	300,043

Thanks!

Valerie

Valerie Bennett, P. Eng, CMVP
Project Advisor – Application Policy & Climate Change
Ontario Energy Board
2300 Yonge St.
Toronto, ON M4P 1E4
Tel.: 416 440-7747
Fax: 416 440-7656
E-mail: **NEW!** valerie.bennett@oeb.ca

From: Deborah Bullock [mailto:Deborah.Bullock@enbridge.com]
Sent: Wednesday, December 27, 2017 10:39 AM
To: Valerie Bennett <Valerie.Bennett@oeb.ca>
Subject: RE: OEB DSM Evaluation Accruals (2016)

HI Valerie,
This is the absolutely last day we can make any additions to our accruals for 2017.
Did you have a summary of the additional EAC member costs for the Nov 1st – Dec. 31st period that should be added to what you provided below?

Thanks,
Deb

From: Valerie Bennett [mailto:Valerie.Bennett@oeb.ca]
Sent: December-13-17 8:38 PM
To: Erin Dunlop
Subject: Re: [External] 2017 Prescriptive C&I Program Evaluation

Hi Erin - got your van but didn't get a chance to call back. Yes the EC costs include the TRM (so the % breakdown by program reflects the TRM). Give me a shout if you want to discuss the other item (I think it's about EAC costs for nov/dec which is what Deb and I spoke about this morning).

Valerie

From: Valerie Bennett [mailto:Valerie.Bennett@oeb.ca]
Sent: Wednesday, December 13, 2017 9:09 AM
To: Deborah Bullock; Erin Dunlop
Subject: [External] RE: OEB DSM Evaluation Accruals (2016)
Attachments: Rest_of_2017_accruals_dec13.xlsx

Hi Deborah and Erin –

Here's the accruals we have for Union and Enbridge, which I've put together with help from DNV GL. I've attached the excel sheet I used to calculate these so you can see the details. I've done this by 2015 and 2016 evaluation years.

2015 Budget - accrual amounts

DNV GL Costs	$	405,494
EAC Costs (pending OEB Panel review, incl. HST – may/may not be included in next invoice depending on when Decision is issued)	$	108,398
Total	$	513,893

Based on the OEB's cost assessment model, apportionment would be:

Enbridge	$	306,742
Union	$	205,968
NRG	$	1,182

2016 Budget - accrual amounts

DNV GL Costs	$	254,668
EAC Costs (none for 2016 DSM Year)	$	-
Total	$	254,668

Based on the OEB's cost assessment model, apportionment would be:

Enbridge	$	152,011
Union	$	102,071
NRG	$	586

Erin, I've further broken down these for Union, since you need them to match the program evaluation budgets approved by the OEB. I'm using the same assumptions (% allocation to each program) that DNV GL used last year (all in the spreadsheet).

Union	2015 Programs	
Program	DNV GL	
Resource Acquisition - Res	$	1,694
Resource Acquisition - C&I	$	102,258
Low Income	$	20,839
Large Volume	$	80,693
Market Transformation	$	484

Union	2016 Programs	
Program	DNV GL	
Resource Acquisition - Res	$	19,153
Resource Acquisition - C&I	$	38,267
Performance-Based	$	6,384
Low Income	$	9,576
Large Volume	$	22,306
Market Transformation	$	6,384

Let me know if you have any questions.

Thanks,
Valerie

Valerie Bennett, P. Eng, CMVP
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Fax: 416 440-7656
E-mail: **NEW!** valerie.bennett@oeb.ca

From: Deborah Bullock [mailto:Deborah.Bullock@enbridge.com]
Sent: Monday, December 11, 2017 9:45 AM
To: Valerie Bennett <Valerie.Bennett@oeb.ca>
Cc: Erin Dunlop <EDunlop@uniongas.com>
Subject: FW: OEB DSM Evaluation Accruals (2016)

Hi Valerie,
Here is what Josh sent last year to outline the outstanding spend there remained in 2016 for work which was to be completed by the year's end but for which the utilities had not yet been invoice. The summary broke out EAC costs vs. contractor costs.

So as a result – in Enbridge's case this email provided support to our accounting folks for me for accrue $319K from our 2016 evaluation budget in anticipation of invoices to come

Hope that helps.

From: Josh Wasylyk [mailto:Josh.Wasylyk@ontarioenergyboard.ca]
Sent: Tuesday, November 22, 2016 2:11 PM
To: Tina Nicholson; Deborah Bullock
Cc: Pascale Duguay
Subject: OEB DSM Evaluation Accruals (2016)

Hi Tina and Deborah,

As requested, here is the accrual information related to the OEB's 2016 DSM evaluation costs.

	2016 Accrual Amount
DNV GL Costs	$494,823
EAC Costs	$39,621
TOTAL	**$534,443**

Based on the OEB's cost assessment model, the apportionment to the utilities would be:

	Utility Share
Enbridge	$319,009
Union	$214,205
NRG	$1,229

Tammy indicated that DNV GL will be sending invoices to the utilities directly in relation to the NTG work.

If you have any questions or would like to discuss, please let me know.

Josh

Josh Wasylyk | Project Advisor| Ontario Energy Board
2300 Yonge Street, 27th Floor |Toronto, ON | M4P 1E4 | Ph: 416 440 7723

From: Valerie Bennett [mailto:Valerie.Bennett@oeb.ca]
Sent: December-04-17 6:05 PM
To: Erin Dunlop
Cc: Leslie Kulperger; Eric Buan; Deborah Bullock
Subject: [External] RE: 2017 Year-End Accruals

Hi Erin – I should be able to provide what Josh provided last time, but won't have time to look into this before Wednesday's meeting. Let's touch base later this week.

Thanks and see you on Wednesday.

Valerie

Valerie Bennett, P. Eng, CMVP
Project Advisor – Application Policy & Climate Change
Ontario Energy Board
2300 Yonge St.
Toronto, ON M4P 1E4
Tel.: 416 440-7747
Fax: 416 440-7656
E-mail: **NEW!** valerie.bennett@oeb.ca

From: Erin Dunlop [mailto:EDunlop@uniongas.com]
Sent: Monday, December 4, 2017 12:23 PM
To: Valerie Bennett <Valerie.Bennett@oeb.ca>
Cc: Leslie Kulperger <LKulperger@uniongas.com>; Eric Buan <EBuan@uniongas.com>; Deborah Bullock <Deborah.Bullock@enbridge.com>
Subject: 2017 Year-End Accruals

Hi Valerie –

Hard to believe but we're fast approaching the end of the year and an important part of completing our DSM year end process is to ensure that all 2017 related expenses are recorded appropriately. In cases where we have not received invoices but work has been performed in 2017, these expenses need to be recorded ("accrued") by Finance prior to year-end. It is essential that we capture all DSM costs in the proper period to ensure that deferral balances and cost recoveries from rate payers are calculated appropriately. In order to accrue expenses, our Finance department requires adequate support to ensure the amounts are accurate. Supporting documentation may include a "draft" of an invoice or a written email communication from the vendor stating the estimated cost associated with the work completed in 2017 that requires an accrual.

I'm assuming we will not be receiving another OEB invoice prior to year-end so we will require a written email from you/DNV outlining the estimated cost of all work completed but not billed to-date as well as costs for work expected to be complete by the end of the year. Estimates for EAC costs are not required - we will use the cost awards in process to account for these.

Last year, DNV provided this estimate and did so by program. Looking back at what Josh provided in August, we were also able to get the first OEB invoice and projected spending for the rest of the year broken out in this manner. I'm hoping we can revisit this issue and get the second OEB invoice as well as the accrual detailed in this way. This is ideal as it helps better assign and track costs and is required for TRC calculations. Josh had grouped costs in the following manner although a category could also be added for general portfolio costs:

- Resource Acquisition – Res
- Resource Acquisition - C&I
- Performance-Based
- Low Income
- Large Volume
- Market Transformation

To adhere to year-end deadlines and provide time for review, approval and processing, we require this information by EOD on December 12th. I'm not sure if EGD has reached out to you yet but they will certainly be in a similar situation and require this information for their year-end accruals too. I will be attending the EAC meeting on Wednesday so, if needed, we can discuss further then.

Look forward to seeing you,
Erin

Erin Dunlop
Senior DSM Program Evaluator
–
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UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 25

Question: Please explain how the delays in the EM&V process were "prejudicial" to the Applicant.

Response:

The delays in the EM&V process were "prejudicial" to Union by creating rate and regulatory instability and inefficiency for the utility and its customers; Union's customers will bear the burden of disposition of 2015 deferral balances no sooner than 2018. This risks eroding confidence in the EM&V process and the utility-customer relationship.

Additionally, the annual EM&V process needs to be conducted as soon as practical after a program year in order to collect the best information possible from customers and avoid confusion related to customer human resource changes. This is particularly true when measuring Free Ridership, which according to leading industry practice, should be gathered as soon after a customer has participated in a program as possible, as noted in Union's application at Exhibit A, Tab 2, Appendix E, p. 5. To the extent less accurate information is obtained due to the delay, this can lead to EM&V results that do not accurately reflect the performance of Union's programs.

Additional impacts of delays are outlined in the response at Exhibit B.OSEA.1 g).

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 28

Question: Please provide copies of all drafts of reports or other documents that were annotated or commented on by OEB Staff prior to being delivered to the EAC, including all such annotations and comments. If the Applicant does not have those documents, please request them from OEB Staff.

Response:

During the 2015 CPSV, one draft report revealed that OEB Staff had commented on draft reports in advance of the EAC. The draft report in question does not relate to Union DSM EM&V activities, rather the notes from OEB Staff were found on an EGD CPSV site report. Union does not believe it is appropriate to provide a draft EGD CPSV report.

Union did request that OEB Staff share the comments that they provided to the EC on all drafts of reports or other documents prior to being delivered to the EAC. OEB Staff declined to share these comments. The EAC received an email from OEB Senior Counsel explaining that OEB Staff did not intend to share the comments that were made with the EAC and that there was nothing improper with the approach they took.

Please also see the response at Exhibit B.Staff.12 b).

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 30

Question: Please advise the legal governance the Applicant proposes with respect to the activities of the EAC, e.g. consensus requirements, voting, weight of votes if any, OEB Staff role as arbiter or tie-breaker, etc.

Response:

The draft charter submitted as part of Union's application was meant as a starting point for discussion. Union is working with the EAC to reach consensus on a charter (also referred to as a Terms of Reference) that includes input from other EAC members. This draft is appended as Schedule 1 of SEC's Interrogatory submission. Union supports the following decision-making governance structure outlined in SEC's appended draft with the exception of the edits and striked-out text as indicated below:

The disposition of DSM related deferral and variance account balance amounts are subject to an adjudicative process, during which an OEB Panel will determine final shareholder incentive and lost revenue amounts based on their examination of relevant evidence, including DSM EM&V reports.

EM&V of DSM programs involve decision points on technical, policy, and other issues. The overarching objective of the ~~EC,~~ EAC and OEB staff will be to ~~attempt~~ achieve consensus on all EM&V related decision points. However, if a consensus is not possible, for the purpose of finalizing DSM EM&V results and reports without undue delay, the following parties will be relied upon to make decisions on each of these points.

Technical EM&V decisions

- *EC, with input from the EAC and OEB staff ~~as requested~~, makes decisions on technical issues related to EM&V reports, including recommended approaches or methodologies based on their expert opinion as evaluators in their capacity as the selected Evaluation Contractor.*

Policy-related EM&V decisions

- *EC and OEB staff, with input from the EAC ~~as requested~~, identifies which EM&V issues are policy issues, rather than technical issues that the EC can resolve*
    - *OEB staff, with input from the EAC ~~as requested~~, instructs EC how to proceed on policy issues, based on relevant OEB DSM Frameworks, Filing*

Guidelines and Decisions. In the event of ambiguity, OEB staff may request information from the EC in relation their experience with similar policies in other jurisdictions. These policy-related decisions are made to move the process forward and are not an OEB adjudication. They are to be documented for the EAC's reference.

Procurement and Administrative EM&V decisions

- *OEB staff, with input from the EAC ~~as requested~~, makes decisions related to other issues, including but not limited to, procurement of DSM contractors (including selection, budget, etc.), and administrative matters (formatting and posting of final reports, etc.), ~~with the exception of:~~*
  - ~~*OEB staff may request input from the EAC on scopes of work developed to procure third party evaluation contractors*~~
  - ~~*OEB staff may invite individual EAC members to participate in these decision-making processes (e.g., evaluation of DSM contractor proposals)*~~

These edits help clarify the areas where members of the EAC can provide input and remove the option for OEB Staff to selectively choose when it requests input into certain administrative EM&V decisions.

Union also suggests text from the draft charter submitted as part of its application be included in the final EAC charter to further support the clarification of where members of the EAC can provide input, and increase transparency on administrative items. These suggested edits are noted below:

EAC member accountabilities include providing input, guidance and advice into:

- *Establishing priorities for potential future evaluation studies with consideration of available resources (such as funding, personnel resources, time limitations);*
- *Selection of any third party commissioned to undertake work;*
- *Specific project management details, such as:*
  - *Budgets and invoicing*
  - *Timelines*
  - *Maintaining scope of work with no allowance for "scope creep"*
  - *Meeting minutes and action items.*

The EAC Coordinator/OEB Staff will adhere to the guiding principles of the Charter and has accountability for:

- *Sharing the full cost of contracts and any budget overspend incurred, with the EAC;*
- *Providing the Utilities with invoices for all EM&V work in a timely manner and include pertinent details sufficient for the Utilities' financial accounting responsibilities, and;*
- *Taking minutes, and sharing these with EAC members for review and approval.*

The EAC would further benefit from a facilitator who does not directly participate in discussions, but rather ensures the effectiveness of the committee in terms of scope, action item reviews, and the taking of minutes. This could be accomplished by having two OEB Staff members attend meetings, with one operating as facilitator, much the way the utilities managed the coordination of the TEC in the previous DSM Framework. Alternatively, Union is willing to support OEB Staff with this responsibility.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 30

Question: Please advise to whom, if anyone, the Applicant believes that the EC should report. If the Applicant believes that the EC should not report to anyone, please describe how the Applicant believes the EC should get instructions on how to proceed with its work.

Response:

While contractual arrangements for procurement would reside with OEB Staff, including management of project timelines and deliverables, the EC should report to the EAC for all evaluation work that falls within the scope of the EAC's purview.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 30

Question: Attached to these interrogatories as Schedule 1 is a draft charter for the EAC prepared by OEB Staff in consultation with the EAC. Please advise whether the Applicant believes this draft charter would be acceptable. If there is anything in it that the Applicant does not believe is acceptable, please provide details, and provide a critical comparison to how the Union Gas charter deals with the impugned issue.

Response:

Please see the response at Exhibit B.SEC.20.

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UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 31

Question: Please confirm that the Applicant believes neither OEB Staff nor the EAC is allowed to modify the objectives of the NTG study from that stated by the Scope of Work approved by the TEC, or make any other changes, including improvements, to that study.

Response:

Not confirmed.

Union believes the EAC should have the opportunity to discuss and agree on potential improvement options as they are posited during the NTG Study. Union takes issue with one party having the ability to modify the objectives or Scope of Work for any EAC governed study. The role of the EAC is to *"provide input and advice to the OEB on the evaluation and audit of DSM results"* per the OEB letter of August 21, 2015.[1]

The revised NTG Scope of Work memo released in June, 2016, as well as the subsequent decision to not include Secondary Attribution in the final NTG analysis, were made in the absence of advance EAC consultation.

[1] EB-2015-0245, OEB Letter, 2015-2020 DSM Evaluation Process of Program Results, August 21 2015, p. 2.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 31

Question: Please provide details of the complaints by the utilities relating to the approach to the NTG study, including copies of any written communications in that regard. Please provide the dates of all such complaints, both before and after the draft results were provided to the EAC. Please provide details of all concerns expressed by the utilities as to the application of any NTG results to 2015.

Response:

Details of all concerns expressed by Union related to the application of any NTG results to 2015 are provided in Union's application at Exhibit A, Tab 2, pp. 7-15.

In brief, results of the ongoing and incomplete NTG Study should not be applied to 2015 for the following reasons:

a) It does not reflect the original and revised OEB Decision and Order on Union's 2015-2020 DSM Plan (EB-2015-0029);

b) If applied, the 2015 audited DSM program results would be inappropriately calculated using different NTG factors than those used to calculate the OEB-approved 2015 targets;

c) It is inconsistent with the scope of the original NTG Study Request for Proposal;

d) It remains incomplete without application of Secondary Attribution; and

e) It remains incomplete without a final determination of Spillover.

Comments a) and b) were first provided in writing on June 13, 2016 in response to the EC's *Proposed Areas of Change for the Custom Program Net to Gross (NTG) Study* memo dated June 6, 2016 (see Attachment A).

Union first raised comment c) in its October 11, 2016 response to the draft NTG workplan with the expectation that it would be discussed in greater detail in an upcoming EAC call:

> *"DNV mentions that NTG results are to be applied to 2015 results yet there are instances where DNV notes that sampling was designed to be applied to future program years. Given that application of NTG results is an agenda item, we seek clarity during this discussion and will provide further comment accordingly."*

During the following EAC call on October 25, 2017, Union explained its position that the application of NTG results to 2015 was inconsistent with the scope of the original NTG Study Request for Proposal, which indicated that Free Ridership and Spillover data collected should be applied to forward looking DSM program activity.

Comment d) was first provided in writing on or about June 14, 2017 in response to the DRAFT 2015 CPSV/NTG Finding report[1] issued on May 24, 2017:

> *"A significant number of discussions were held during the development of the NTG scope on the inclusion of secondary attribution. DNV's final NTG Scope of Work confirmed that secondary attribution would be quantified for all measure types. There was no indication that it would not be used in determining net savings. Not using these results is a significant departure from the scope that was agreed upon. Since FR values with secondary attribution have been quantified, they should be used as part of the NTG value."*

On October 16, 2017 OEB Staff issued a letter officially declaring that the 2015 EM&V process was closed. Within this letter, OEB Staff noted its decision to direct the EC to apply a deemed Spillover rate to expedite a component of the EM&V process that was already well over a year behind schedule.[2] Written comments were not requested by OEB Staff or the EC on this decision. Therefore, comment e) was provided verbally during the following EAC meeting.

Without official EAC meeting minutes, there is no written record of comments c) and e) made verbally during EAC calls.

Union is not aware of any other written documents setting outside these comments.

[1] Union is not in a position to produce draft reports absent direction from the Board. Please see response at Exhibit B.EP.4.
[2] EB-2015-0245, OEB Letter. 2015 DSM Results Reports, October 16, 2017

DNV·GL

Memo to:
Natural Gas Demand Side Management Evaluation Advisory Committee (EAC)

From: DNV GL-Energy
Date: June 6, 2016
Prep. by: Ben Jones

Proposed Areas of Change for the Custom Program Net to Gross (NTG) Study

This memo presents the high level changes the evaluation team anticipates for the NTG Study as a result of integrating the 2015 custom program savings verification (CPSV) effort.

1. Scope – The January 2016 OEB Decision and Order specifies that the utilities are not expected to rely on pre-determined net-to-gross adjustment factors when calculating savings for custom projects. Based on the OEB's findings, evaluating the NTG adjustment factors, particularly free ridership, of custom programs on an annual basis is consistent with the OEB's Decision and ensures that industry best practice is followed.. Originally the scope of the NTG study was to develop a factor that would be used on a "go forward" basis (or as a pre-determined value applied in each year following the study) and that was supported by sample sizes large enough for 90/10 precision when applied to a future program year. In practical terms this means that the estimates of error used to determine the study's precision did not use the Finite Population Correction (FPC) that reduces the error estimates that apply for retrospective evaluations. FPC reduces sample sizes required, saving time and expense for retrospective evaluation.

    a. **CHANGE:** For free ridership, the January Decision and Order means that FPC errors are applicable, reducing the required sample size and free ridership is only required for the 2015 programs (as opposed to also including 2014 programs).

    b. NO CHANGE: We continue to recommend that Spillover for custom programs be evaluated based program participation in the 2013 and 2014 program years to determine a factor to apply to 2015 results. Effective retrospective evaluation of spillover based on the 2015 program year would occur too late for it to be used in program filings for utility incentives and lost revenue.

    Spillover will include inside and outside types as originally described (Overview, Key Concepts pg 4-5). Like and unlike dimensions of spillover will also both be evaluated. The additional effort required to add unlike spillover to our planned approach is a handful of additional questions asked of a portion of respondents. The program theory for unlike spillover is that these measures are due to site audits, rather than a positive experience with a program measure. Because of this distinction we recommend evaluating attribution of unlike spillover as independent of the attribution of the original program measure.

2. NO CHANGE: Run-it-Right for Enbridge will be included in the evaluation, but treated as a separate program apart from the other Custom C&I programs. Results from the evaluation of Run-it-Right will likely be applied to the Union RunSmart program as well.

Comment [EB1]: As per Board Decision on Union's Commercial and Industrial Program (January 20, 2016 EB-2015-0029 Decision 5.2.6 pg 21), the free rider rates for Union's Commercial and Industrial program will be updated starting with the 2016 program year (not 2015). The OEB does not expect the gas utilities to rely on a predetermined free ridership rate for the duration of the 2017 to 2020 term.

The dates provided in this Decision clarify the Board Decision on section 9.5 Input Assumption and Net-to-Gross Changes (pg 75).

Comment [ML2]: Please provide support that this is considered industry best practice.

Comment [EB3]: Union interpreted the Board's Decision 9.5 to mean that "input assumptions and net-to-gross adjustment factors are finalized for a given year based on the previous year's final DSM audit." (Letter of February 3 2016, EB-2015-0029 – Union Gas Limited 2015-2020 DSM Plan – Written Comments).

This Letter (pg 3) also specifically asked for clarity that "Union's 2015 results for the purpose of determining the 2015 DSM Incentive will be based on the same input assumptions and net-to-gross adjustment factors used for setting Union's 2015 targets. These inputs were finalized in Union's 2014 DSM audit."

The Board's Revised Decision (February 24, 2016, Decision 2.2, pg 3) confirms that Union's interpretation above is correct.

Comment [ML4]: Has DNV been provided with the **February 24, 2016** revised Board Decision and Order? This is a critical document for DNV in terms of evaluation result application.

Page 2 of 3

3. Sampling – The units of analysis and stratification defined for the NTG sampling approach may require adjustment to accommodate CPSV (Task 2: Sample Design pg 8). Stratification is most efficient when the variance among strata is greater than that within strata.

    a. Both NTG and CPSV sampling are made more efficient when stratifying by project size and oversampling the large projects.

    b. For NTG we identified the most relevant distinction among projects as the difference in decision making for firms considering operational improvements or maintenance versus purchasing new equipment.

    c. For CPSV the primary relevant division is between projects that use standardized calculation methods and projects that are more unique. With large programs that have descriptive tracking data, stratifying by measure types is also effective as long as the divisions are not made so fine that the design loses the efficiencies of stratifying by size.

    If the utilities can identify the projects that use standard Excel calculators (Union) or Etools (Enbridge), stratifying on this basis would allow the CPSV effort to allocate resources more efficiently and get more accurate and precise results.

    For the combined NTG and CPSV, stratification by Utility – Program – "Equip vs O&M" – Calculation type (or measure type) – Size would likely result in a too finely stratified study that loses much of the efficiency that size stratification adds.

    CHANGE: Our recommendation is to remove the "Equip vs O&M" stratification level, but retain the distinction as a reporting domain within each program in the analysis. This allows us to apply the NTG at that level, but means we will not be targeting precision levels and sample sizes for Equipment and O&M measures separately. To the extent that maintenance measures are either correlated or not with Union's standard calculators and that optimization measures are either correlated or not with Union's standard calculators and Enbridge's Etools, we may have some indirect control over the Equipment and O&M sample sizes with this approach.

4. Documentation and Contact Requests (Task 3.4 pg 29) – The number of projects for which the evaluation requests contact information and documentation is a function of the sample size and the anticipated response rate. The utilities indicated that their experience with past CPSV efforts suggests a higher response rate than DNV GL has seen in recent studies in the US Midwest, possibly due to having utility representatives visiting sites with the evaluation engineer and smoothing the way. For NTG, utility involvement in the data collection would result in the appearance of bias. The approach we have used in the past and currently recommend for this study is:

    a. The utilities send advance letters or emails using utility letterhead. This communication encourages companies to cooperate with the evaluator. This is the utilities only direct involvement as part of the NTG portion of the evaluation.

    b. The NTG portion of the evaluation is handled on the phone by a trained evaluation engineer (either an Itron or DNV GL employee). If the site is also selected to receive an on-site, the evaluation engineer will begin scheduling the visit. To reduce any bias (real or perceived),

Comment [EB5]: It is unclear how the NTG segmentation will connect with CPSV stratification. How can we ensure that a statistically significant sample for NTG will be statistically significant for CPSV and vice versa? Please provide clarification.

Comment [ML6]: Please provide details on how this works and how it makes the NTG sampling more efficient and the resulting impact on accuracy.

Comment [EB7]: How is DNV going to ensure that divisions don't reach this threshold?

Comment [ML8]: It is unclear as to how the NTG ratios for Union will be reported. At a segment level? At a measure type level? Please provide further clarification.

Comment [ML9]: This isn't characterized accurately. It should be noted that this is part of the agreement with the customer in their acceptance of an incentive. CPSV is mandatory.

Comment [ML10]: It was previously suggested that the utilities were going to coordinate the on-site scheduling. DNV should provide clarity on how the NTG phone interviews and CPSV on-sites will be coordinated.

Comment [TN11]: It is utility recollection that NTG was always a phone interview. Please explain when an onsite for NTG would be used.

the utility will not be included for on-site visits that require onsite completion of the NTG component.

c. The utility representative (project manager and/or account manager), in concert with the assigned on-site engineer, will complete the scheduling process for all other CPSV related evaluation activities. Depending on the complexity of the site, the on-site engineer may work for Stantec, DNV GL, or Itron.

Comment [TN12]: Even if utility personnel would be removed from the NTG component, utility personnel are a requirement for CPSV.

CHANGE: While this process will likely hold for the majority of the projects in the CPSV and NTG samples, there may be some exceptions for very large or very complex projects. DNV GL is considering on-site, in-depth NTG interviews using Itron or DNV GL engineers. In these situations, it is not appropriate to have the utility representative on-site to influence the NTG responses.

Having NTG and CPSV integrated into a single study does not mean that the final completed samples for each effort are the same. Ideally they overlap completely, but there are always respondents who will respond to one, but not the other. While this reduces the response rate for each component somewhat, in our experience most companies that agree to one will agree to both. In plan, the CPSV will be either the same sample as the NTG or a subset of the NTG sample.

5. Survey Design (Task 3.3, pg 28)– The study originally included 3 years for the sample (2013, 2014 and 2015) with two years of spillover (2013 and 2014)and two years of free ridership (2014 and 2015).. Under the original scope, 2014 acted as an overlap year.

   POTENTIAL CHANGE: Because free ridership is no longer part of the 2014 scope and because unlike spillover is included, we are considering re-arranging the spillover survey guides in a way that addresses spillover up front (following the framing section), and only asks about the free ridership of the original measure when spillover is reported by the customer. This change will reduce customer burden overall.

Comment [TN13]: This appears to be a logical approach in saving time – can rationale be provided why this approach wasn't suggested in the original work plan?

6. **POTENTIAL CHANGE:** Methodology (Task 4.1 pg 33)– Depending on whether the CPSV effort attempts to verify all 2015 NTG projects or only a subset, the LCNS calculation method for the free ridership score may be employed.

7. **CHANGE:** Communication (Task 5 pg 34)– The shift to OEB management of the contract will result in changes to the deliverables section of the work plan, specifically status reports, who receives what when, and the timing of the complete methodology memo (now timed to coincide with the draft survey/interview guides).

Comment [TN14]: Given the established Tri-Party Agreement between Enbridge, Union and DNV Kema this section related to communication changes has been forwarded to our legal and procurement departments to review and advise.

We will advise shortly.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 32

Question: Please provide evidence that the EAC reached a consensus to include spillover questions in the NTG study. Please explain why those questions were to be "less rigorous".

Response:

Union does not suggest that consensus was achieved by the EAC to include Spillover questions in the NTG Study. Without official minutes for EAC meetings, there is no evidence that the EAC reached such consensus.

Questions regarding Secondary Attribution, which is connected to Free Ridership determination rather than Spillover, were expected to be less rigorous as per the EC's NTG Scope of Work:

> *"The effect on the current project of prior and indirect program experience [i.e. secondary attribution] will be captured in a secondary, less rigorous question sequence.*[1]*"*

Questions regarding Spillover were not meant to be less rigorous. On the contrary, Spillover determination was subject to its own statistically significant sample, survey instrument and methodology.

[1] Exhibit A, Tab 2, Appendix D, p. 44

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 32

Question: Please provide details as to how Secondary Attribution was factored into the Applicant's targets for the custom C&I program, including copies of the Applicant's relevant planning documents so demonstrating.

Response:

Secondary Attribution was not factored into Union's targets for the custom C&I program.

The NTG values used for the purpose of Union's DSM targets only included Free Ridership. This is consistent with the 2006 DSM Generic Proceeding, which only discussed Free Ridership and did not contain any mention of NTG, Spillover or Secondary Attribution.[1]

The Custom NTG Study[2] undertaken in 2008 did include a Spillover value of 10%. However, it was never applied to Union's results or targets based on the OEB requirement of Free Ridership alone at the time the report was released. It is worth noting that while EB-2006-0021 Framework does not mention Spillover, Secondary Attribution or even NTG, with the exception of verification, any changes that were made through the annual audit process to input assumptions, including Free Rider rates, were to be applied prospectively for the DSMI (then titled SSM), and retroactively for LRAM calculations.

[1] EB-2006-0021, Decision, Issue 12, p. 44
[2] Exhibit B.Staff 5.Attachment F, pp. 25 - 158

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 35

Question: Please explain why it is an auditor's responsibility to provide their calculations to those being audited, rather than those being audited providing their calculations to the auditor. Please compare the "transparency" being proposed by the Applicant to the practices of auditors and audited companies in financial audits.

Response:

It is Union's position that both auditor and auditee should be responsible for the provision of calculations to enable a transparent review of the contents of each calculation and any related adjustments.

Union would draw similarities between a DSM audit and a financial audit to the extent that findings of each should be reproducible. As per the reference to Union's application, reproducibility is important for a number of reasons. It holds an auditor accountable to his or her findings and ensures that any adjustments made to the data being audited are consistent with the methodology, assumptions, and approach that the auditor has reported to have taken. Having reproducible audit results adds to the level of transparency needed to facilitate a critical review of audit conclusions and helps identify possible material errors. Ultimately, those being audited should be able to understand how the auditor reached his or her conclusions. Provision of calculations is a means to accomplish this.

Historically, DSM auditors achieved this level of transparency by providing live calculations for adjustments and/or sufficient information for Union to replicate the adjustments being made. The provision of this information enabled Union to confirm the resulting impact the audit adjustment(s) had on the DSM program results being audited.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 35

Question: Please provide specific details of the information withheld by the EC from the Applicant, and the reasons the EC claimed the information had to be withheld.

Response:

The EC withheld the following documentation, calculations or other detail necessary to reproduce its audit findings from the Applicant for the following reasons:

How CPSV sample strata and weighting were derived –
The EC indicated they used statistical software that determined the strata and weighting based on the project population.

CPSV project-specific calculations –
It is Union's belief that live calculations were not provided due to resource and time constraints. However, in the absence of EAC meeting minutes or agreement items for the 2015 audit pertaining to the provision of site-specific calculations, Union cannot confirm this.

An explanation (or live calculators) showing how CPSV project level adjustments translated to calculating the overarching realization rates –
Union has no record of the reason these details were not provided. There were no EAC meeting minutes or agreement items recorded for the 2015 audit pertaining to the provision data to clarify the CPSV realisation rates.

Union's confidence in the results related to the items above remains uncertain. This reflects the fact that there were instances where the EC provided sufficient information to verify calculations and subsequently errors in the calculations were discovered. This was the case with LRAM calculations which were originally 40% understated.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 36

Question: Please confirm that, in past EM&V processes, many details of calculations were available to the auditor and the utility, but not to the non-utility members of the Audit Committee. Please describe the types of information that were withheld from the non-utility members.

Response:

As part of the enhanced stakeholder engagement processes that were established with the 2012-2014 DSM Framework, DSM audit transparency was broadened such that all utility and non-utility members of Union's Audit Committees had access to all calculations used to prepare and audit all inputs that enter into LRAM, cost effectiveness and shareholder incentive results. These calculations were either provided to non-utility members of the Audit Committee or it was made clear that they were available upon request.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 36

Question: Please describe the benefits and disbenefits of negotiated NTG results vs. empirically or independently derived NTG results.

Response:

To clarify, the referenced evidence relates to the Navigant Study that identified jurisdictions with similar DSM Frameworks and carbon reduction programming in place that have developed considerations that either reduce or remove the impact of after the-fact NTG studies to utility incentives. A negotiated NTG value in this instance relates to the ability of stakeholders to have the opportunity to suggest modifications to the initial NTG estimates, with the objective of arriving at an agreed upon NTG value that takes the experience of stakeholders into consideration. This is consistent with a triangulated approach or a Delphi panel.

Union's understanding of benefits and disbenefits of negotiated NTG results vs. empirically or independently derived NTG results are provided below, and are informed by information that has been shared in the DSM Mid-term review[1] and in this proceeding. Union's analysis assumes that a negotiated NTG value would be an EAC-led process that considers:

- Studies from similar jurisdictions;
- Market sales data analyses;
- Potentially top-down and/or macroeconomic models of data on programs and target markets; and
- Engineering estimates.

Benefits:

i. Mitigation of self-report survey bias, which can lead to inaccurate NTG adjustments
ii. Reduction of costs associated with NTG studies
iii. Improved customer satisfaction as the result of reducing survey fatigue
iv. Improved EM&V timelines
v. Reliability of assumptions
vi. Reduced resource burden on EAC and OEB to manage the studies

[1] EB-2017-0127, Union DSM Mid-Term Review Part One Submission, pp.12-13

Disbenefits:

i. The perception that the negotiated value does not directly reflect the influence a DSM program has on a customer's decision to participate in the program.
ii. Requires market sales data to inform negotiated values which may not be readily available and requires new research.
iii. Achieving consensus may be difficult when there are disparate stakeholder perspectives.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, p. 38

Question: Please advise whether the Applicant is proposing 100% free-ridership, 0% free-ridership, or some other number for Union's Large Volume Direct Access Program.

Response:

The NTG value for Large Volume Direct Access program should be the same value that is used as an input to setting the targets for the program, which is 46%. For simplicity, Union proposes no adjustment be made to the NTG factor used as an input to the current targets. Please see the response at Exhibit B.Staff.3 for these NTG values. In the event that adjustments are made to the 2015 NTG value, considering the unique nature of the Large Volume Direct Access program and that 2015 was a roll-over/transition year; the target mechanism/NTG input values should likewise be adjusted. This is consistent with Union's position as established as part of Union's 2015-2020 DSM Plan proceeding (EB-2015-0029).[1]

[1] EB-2015-0029, Interrogatory Responses – Corrected, July 3 2015, Exhibit B.T2.Union.GEC.31.p. 1.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix A, p. 1

Question: Please advise whether the primary goal of the EM&V process should be the accuracy of the results, or the predictability of the results, or the a priori reasonableness of the assumptions used. If all are important, please rank in accordance with the Applicant's views underlying the Applicant's draft charter.

Response:

It is Union's position that the primary goal of EM&V activities depend on the activity in question, and as such, ranking the goals would be activity-specific.

The referenced material in Union's application at Exhibit A, Tab 2, Appendix A, p.1, notes that the activities undertaken by the EAC are intended to instill confidence in the EM&V process, including the accuracy of reporting and the calculation of the DSM Variance Account ("DSMVA"), Lost Revenue Adjustment Mechanism ("LRAM"), and Demand Side Management Incentive Deferral Account ("DSMIDA"). It also provides confidence that program results are calculated using reasonable assumptions.

While the draft EAC Charter does not discuss the predictability of results, predictability is also considered a priority in terms of planning for a DSM program year to allow Union to effectively use approved annual budgets to support delivering cost-effective programs to help customers reduce their demand for natural gas. As with many performance management processes, historical performance is a fundamental input into the creation of targets. To this end, predictability enables the company to strategically dedicate resources to drive savings with customers where opportunities exist. When key input variables are changed after the program year has ended, and in the current situation, two program years after that time, the utility is no longer able to affect any strategic changes to the budget allocation in the following year, thus limiting performance potential in the subsequent year at a minimum.

While all the objectives noted in the question above are desirable, the practical application of EM&V encompasses a broad range of evaluative efforts and considerations. Depending on the evaluation scope, the priority of the objective might be different. DSM impact evaluation activities are designed to validate savings that are hypothetical using historical energy consumption data, codes, standards, industry practice, and in the case of NTG, even an element of the psychology of decision making. The annual DSM audit process is intended to provide confidence that projected savings claimed by utility DSM programs are based on reasonable

engineering estimates; on a case-by-case basis for custom measures, and on a more generic input assumption basis for prescriptive measures.

To illustrate the different objectives for EM&V activities, custom projects could be considered as an example. CPSV can validate the reasonableness of engineering calculations used to estimate custom project savings, which is how the Board has described the intention of EM&V for custom projects. In this case, accuracy is achieved through the sampling methodology, which makes accuracy a priority for sampling. A unique component of custom projects, however, is the expected useful life of a technology. The effective useful life for custom projects applies one value for a given technology, which would suggest that the life of the measure is not custom or in relation to a case-by-case assessment, but rather it is more prescriptive in nature. Evaluating custom measure lives as a prescriptive input assumption provides predictability in the results of the custom program for the utility, and also engenders confidence that the useful life values are reasonably accurate. However, evaluating the expected life of a technology for all custom projects effectively with the pure objective of accuracy would require a primary research. In this case, it might be more practical to look at all available information and make some assumptions, thus prioritizing reasonableness and predictability or probability that the measure life is accurate.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix A, p. 2

Question: Please confirm that the Applicant is proposing that the utilities be the sole arbiters of what information is confidential.

Response:

Not confirmed.

The Draft EAC Charter was included in evidence as a starting point. Union proposes that information can be designated as confidential by the OEB or the utilities.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix A, p. 4

Question: Please confirm that the Applicant is proposing to restrict the role of OEB Staff to an administrative role, and that OEB Staff would not be allowed to provide input to the EAC or to the EC of a substantive nature. Please confirm that the Applicant is proposing that OEB Staff not be allowed to comment on, or suggest interpretations of, Board decisions or communications.

Response:

Not confirmed.

OEB Staff should be able to provide input into the EM&V activities they are coordinating. Union's draft EAC Charter was included in evidence as a starting point. Please see the response at Exhibit B.SEC.20.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 3, p. 13

Question: Please explain the very poor results for the Large Volume Program.

Response:

Union's Large Volume program cumulative natural gas savings achievement has been smaller relative to the three years used to establish the targets for the program. This can largely be attributed to the drivers summarized below:

- Changes in the contracts of the power producers from base load to peaking plants;
- A lack of customer available funding for capital projects due to their economic constraints;
- Modifying the eligibility requirements for routine maintenance projects; and,
- A decrease in opportunities as a result of prior participation in DSM programs.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 3, p. 18

Question: Please provide an update on the status of the Applicant's work in coordinating CDM and DSM programs.

Response:

Union's current efforts to coordinate CDM and DSM programs are included in Union's January 15, 2018 DSM Mid-Term Review – Part Two Requirement Two Submission.[1] As part of the OEB's decision on Union's 2015-2020 DSM Plan it stated that the utilities should be in a position to report on progress made in developing integrated conservation programs and further that the OEB expected that at least one jointly offered program would be available in market by the Mid-Term Review.[2] In response to this direction, Union developed two integrated natural gas and electricity energy conservation offerings:

1. The Home Reno Rebate offering, and

2. The Commercial/Industrial Direct Install offering.

[1] EB-2017-0127, Union DSM Mid-Term Review – Part Two Requirement Two Submission, pp.23-27
[2] EB-2015-0029, Decision and Order, p. 82

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.4

Question: Please confirm that the "experts" interviewed for the case studies were three utility staff, three staff of regulators, and four energy efficiency consultants. Please advise how many of the regulatory staff and consultants were former utility or program administrator employees. Please advise how many of the consultants were representatives of customers or customer groups.

Response:

The case study interviewees included: two commission staff, three utility staff, and five consultants. For the states which they were interviewed, two consultants work on behalf of commission staff, two consultants conduct NTG evaluation studies, and one consultant is a former commission staffer. Our interviews did not ask interviewees about their former positions or other consulting engagements.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.4, 14, 17

Question: Please confirm that, in California, custom C&I NTG is measured by after-the-fact self-report surveys, which are then applied retrospectively.

Response:

Correct.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.4, 14, 17

Question: Please confirm that all of the utility experts were included in those who complained about application of NTG retrospectively.

Response:

Respondents noted difficulties with applying NTG retrospectively across all interviewee types.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.9

Question: Please discuss the relative value of accuracy vs. predictability in deciding whether to apply NTG results prospectively or retrospectively.

Response:

Page 9 describes tradeoffs reported by experts in Massachusetts regarding prospective versus retrospective application of results. The relative value of these tradeoffs depends on the policy priorities of individual jurisdictions and their stakeholders.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.10

Question: Please discuss the extent to which it is appropriate for an EM&V contractor to withhold from utilities specific information from NTG surveys that could be used to identify individual customers. Please include discussion of the appropriate application of this issue in the context of custom C&I NTG studies.

Response:

Confidentiality is important and, if promised as part of the survey framework, it would be inappropriate to share sensitive information that could be used to identify individual customers. However, it is also important to provide transparency in how different responses drive the NTG estimates. In the experience of the Navigant team, it has always been possible to provide information in a manner that provides adequate transparency while also protecting individual customers.

Multiple (i.e., 3) interviewees stated that confidentiality of customer responses is important and evaluators often cannot or do not share individual responses. Although provision of individual responses was only reported in the Illinois case study (p 25), in that instance identifying information was redacted. There are other ways to provide transparency into responses and calculations without divulging confidential information. As described on page 10 of the report, one interviewee stated, "cross-tabulations or frequencies can be used to understand how responses to certain questions drive the NTG values and conduct sensitivity analyses (e.g., looking at impacts of specific questions on the scoring algorithm). This approach protects confidentiality while providing information necessary to understand what questions and responses affect the final NTG estimates." Another interviewee noted (p 19) that in California, CPUC staff and consultants will hold a meeting with utility representatives to provide transparency on methods and calculations without providing confidential information.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.15, 20

Question: Please discuss the basis for the California 5% spillover adder, including any studies done and any variation in its application across various program types.

Response:

The California CPUC (Decision 12-11-015 November 8, 2012, pages 55 and 56) provided the following information about the 5% spillover adder:

> "Therefore, the Navigant team believes that accepting the program-specific values proposed by the IOUs for the 2013-2014 portfolio would convey a false specificity and accuracy in this important area when the appropriate research and data does not yet exist.
>
> Instead, at this time the Navigant team finds it more appropriate to apply a portfolio-level "market effects adjustment" of 5% across the board to the entire 2013-2014 portfolio cost-effectiveness calculation in recognition that California's long history of commitment to energy efficiency resources has resulted in measure adoption outside of program channels. This is analogous and parallel to our default NTG ratio prior to completion of specific studies on program free ridership.
>
> A case could be made that the Navigant team could develop a middle-ground approach based on spillover theory and existing data, such as applying sector-level or age-of-program differentials, but absent any comments in the record to support these types of approaches, the Navigant team think the portfolio-wide adjustment better represents the state of recent research in this area in California and does not convey false precision."

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.17

Question: Please provide a summary of best practices for program administrators in pre-review and screening of custom C&I projects to "assess NTG and baselines prior to project approval".

Response:

As part of the report, the Navigant team did not conduct research or find existing research of best practices for pre-review and screening of custom C&I projects.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.18

Question: Please provide a critical comparison of the California process outlined in Table 3 to the current process used in Ontario.

Response:

As part of the report, the Navigant team did not conduct a critical comparison of the California process and the Ontario process.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.21

Question: Please confirm that the Illinois SAG is a large group, is dominated by utility participants, and has only limited participation by customer groups.

Response:

Our research did not conduct an analysis of parties that dominate or have limited participation in the Statewide Advisory Group (SAG). Four utilities participated in the SAG including ComEd, Ameren Illinois, Nicor Gas and Peoples Gas - North Shore Gas.

In addition to the four utilities, there were 61 non-utility participants. The full list of participants can be found on the SAG website: http://www.ilsag.info/meeting-participants.html

The SAG policy manual states: "Attendance and participation in SAG is open to all interested stakeholders. Program Administrators offering Programs pursuant to Sections 8-103B and 8-104 of the Act shall participate in the EE SAG, as directed by the Commission." (p 1 of Illinois Energy Efficiency Policy Manual Version 1.1 - A Manual Guiding the Operation of Illinois Energy Efficiency Programs).

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.22

Question: Please explain why Illinois applies realization rates retrospectively, but NTG only prospectively.

Response:

As noted on Table 4 (p 22), Illinois uses prospective application of realization rates for TRM-based measures. For custom measures (i.e., measures that fall outside of the TRM), Illinois applies realization rates retrospectively. The reason for this is explained in the Illinois TRM:

> "In exceptional cases where the participant, program administrator, and independent evaluator all agree that the TRM algorithm for a particular energy efficiency measure does not accurately characterize the energy efficiency measure within a project due to the complexity in the design and configuration of the particular energy efficiency project, a more comprehensive custom engineering and financial analysis may be used that more accurately incorporates the attributes of the measure in the complex energy efficiency project. In such cases and consistent with Commission policy adopted in ICC Docket No. 13-0077, Program Administrators are subject to retrospective evaluation risk (retroactive adjustments to savings based on ex-post evaluation findings) for such projects utilizing customized savings calculations." Page 25, Volume 6.0.

As a general comment, the observed changes in ex-post realization rates compared to ex-ante values have been smaller program-wide than is typically found for net savings ex-post and ex-ante estimates. This realization rate adjustment is usually much smaller and does not have the same negative effects on program planning and delivery incentives that are generally found when NTG is applied retroactively.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.23

Question: Please advise whether the expert agrees with the statement "utilities have a decent amount of influence in terms of how they influence programs to push higher NTG or lower". Please explain why.

Response:

Utilities can influence the NTG levels through their control of program elements, such as program design, marketing, technical assistance and eligibility requirements.

The term "decent" was used by the interviewee contacted as part of the research effort on page 23 (B/6/1). The Navigant team cannot comment on this adjective in the quote.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.23

Question: Please advise whether the expert agrees with the statement "assessing net savings is particularly important for custom programs because it is common to pay for projects that would have happened otherwise". Please explain why.

Response:

The Navigant team agrees that assessing net savings is important for all measure and program types, including custom programs. The Navigant team do not necessarily agree that paying for custom projects that would happen otherwise is "common", as the frequency of occurrence depends on multiple factors, such as program design and eligibility requirements.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.24

Question: Please discuss the extent, if any, to which applying NTG results prospectively as opposed to retrospectively reduces the incentive on program administrators to design and implement programs with a view to improving NTG.

Response:

The extent to which the timing of NTG results application influences program administrators' behavior is influenced by multiple factors, including savings goals, incentive calculations, and frequency of updates.

As noted on page 24, in Illinois there were early concerns that utilities would have less incentive to monitor NTG under a prospective framework, but interviewees noted that the annual update of the NTG values provides incentive to utilities to try to reduce free ridership.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: Exhibit A, Tab 2, Appendix E, p.38

Question: Please confirm that 24 of the states studied use net savings, 11 of those states apply the adjustment to custom C&I programs retrospectively, and 3 of the remaining 13 states have a fixed value. Please confirm that 10 states apply their net savings adjustment only prospectively.

Response:

Yes, those numbers are correct. Therefore, 13 of 24 states determine NTG for their custom programs prior to the beginning of a program year.

UNION GAS LIMITED

Answer to Interrogatory from
School Energy Coalition ("SEC")

Reference: General

Question: Please review the recommendations in Section 5.2.1 of the DNV GL report 2015 Annual Verification dated October 12, 2017, and advise in each case whether the expert agrees with the recommendation, and whether the recommendation, in the expert's opinion, represents best practices.

Response:

The agreement or disagreement with the DNV GL report recommendations in section 5.2.1 are shown in the table below and is based on Table 1-5 from the DNV GL report:

#	**Energy Savings and Program Performance Recommendation**	**Agree/Disagree and Comments**
ES1	The utilities should continue in their commitment to accuracy.	Agree, with a comment. In addition to accuracy in engineering estimates of savings, there should also be a commitment to improving processes used to estimate NTG over time. One concern with the recent NTG study is recall bias. Asking customers about what actions they might have taken in the absence of the program where there is a time lag of over two years after participation raises concerns over recall bias affecting NTG estimates. Recall bias is one of the most oft-cited concerns with self-report survey methods, and actions should be taken to reduce the lag between participation and when participants respond to the NTG self-report survey. There should be a statement in the recommendations regarding actions that can be taken to help address recall bias. This time lag may have been unavoidable. It may have been the case that, in the recent DNV NTG study, the time lag between survey and time of participation might have been unavoidable, but this shouldn't be true going forward.

ES2	Evaluate free-ridership for the programs annually and consider coupling the free-ridership evaluation with process evaluation	Disagree. The narrow focus of the recommendation on only evaluating free-ridership should be expanded to include other components of NTG (e.g., spillover and possibly qualitative judgments of market effects). With respect to the recommendation for free-ridership evaluation to be performed "annually," it is unlikely that free-ridership will vary substantively from year to year, and annual evaluations of free-ridership likely will cost more to conduct than the value of the information produced by the effort. In addition, these studies should address other components of NTG, including spillover. Some jurisdictions will conduct process evaluations in years that NTG is not being evaluated. This timing helps avoid customer fatigue. Having customers answer process evaluation surveys/interviews, combined with responding to NTG surveys in the same year, could result in customer fatigue. There are a number of research designs that could be considered. For example, a fast-feedback free-ridership survey could be used to address free-ridership factors almost continually. The fast-feedback approach contacts almost every participant via e-mail or phone within a couple of months after participation. This streamlined survey approach can be complemented by a more in-depth NTG study every other year. A number of research design alternatives should be considered that would balance out research costs with the information needed to make program decisions and assess net savings.
ES3	Error ratios from this report inform sample design for future evaluation.	Agree, with a comment. The error ratios should be one factor that is used to inform future sample designs, but the ratios should be augmented with other information. For example, if it is determined that changes in the scoring or questionnaire banks are warranted in future efforts, then the ways in which these changes might impact the standard deviation of the estimates should also be considered.
ES4	Align the program design with cumulative net goals	Agree.
ES5	Do not pay incentives until after installation is complete.	No opinion. The Navigant team does not have the information to express an opinion on the findings and the resulting recommendation.

ES6	Develop policies to collaborate across electric and gas projects to avoid double-counting fuel savings and increases from energy efficiency measures.	Agree, but potentially complex. Policies should be developed at two levels. At the province level, energy savings from electric and gas projects should avoid double counting. This should be straightforward. At the utility or program implementer level, there are questions about whether the savings from electric and gas projects should be broken out by those attributable to the gas utility and those savings attributable to electric utility efforts. Separating out attribution from joint projects can be difficult and somewhat arbitrary. The Jurisdictional Review (Exhibit A, Tab 2, Appendix E) examined how attribution was addressed in joint projects in the three case study states, and the Issues Memo (EB-2017-0324, Exhibit B, Tab 6, Schedule 2) also addressed the difficulties of parsing out individual utility attribution. In general, most jurisdictions have not found it useful to try to explicitly estimate the individual utility attribution of savings for joint/collaborative projects.
ES7	Consider establishing a policy to define rules around energy savings calculation for fuel switching and district heating/cooling measures.	No opinion. The Navigant team does not have the information to express an opinion on the findings and the resulting recommendation.
ES8	Consider establishing a policy that defines an eligibility floor and cap based on simple payback period for energy efficiency projects.	Disagree. This type of policy can have unintended side effects in designing cost-effective programs and providing opportunities for broad participation across customers eligible for a program.
ES9	Consider establishing an official definition for EUL and implementing a study to define EULs for program measures	No opinion. The Navigant team does not have the information to express an opinion on the findings and the resulting recommendation.
ES10	Track metrics for how long it takes from the final installation verification to the posting of incentive payments.	No opinion. The Navigant team does not have the information to express an opinion on the findings and the resulting recommendation.
ES11	Increase transparency of “influence adjustments” and do not include in gross savings	No opinion. The Navigant team does not have the information to express an opinion on the findings and the resulting recommendation.

ES12	Conduct a process evaluation to improve Large Volume influence on customer projects	Agree with comment. A process evaluation should be conducted for all large programs. As a note, some free-riders are to be expected in even the most well-designed program, and even relatively high levels of free-ridership are not necessarily bad as long as the program is cost-effective. Often, high levels of free-ridership occur with more mature programs and are accompanied by great amounts of spillover and market transformation/effects. A complete picture of program-influenced energy savings is needed that include all the components of NTG.
ES13	Consider approaches to market that leverage third-party vendors.	Agree with comment. Clearly, this consideration is a best practice for most any EE program. The DNV study found trade ally influence to be relatively low. However, this finding could be due to the survey design where this influence was explored only when the customer "recalled" trade allies as being influential in their decision. Exploring the role of trade allies known to have participated with the program more directly might have shown the influence of these important market actors to be more significant. Customers may not be aware of all the different ways trade allies can influence program savings and, if aware, they may not accurately recall the role of trade allies after a two-year time period. This could have increased the program influence identified in the NTG study.