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January 21, 2014

VIA COURIER, EMAIL, RESS

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

Re: Enbridge Gas Distribution Inc. ("Enbridge" or "Company")
Ontario Energy Board File: EB-2013-0352
Revised Application for 2012 Demand Side Management ("DSM") Clearance of Variance Accounts

Enclosed please find the following documents in support of the revised Application by Enbridge for the clearance of the 2012 DSM Deferral and Variance Accounts.

The 2012 Audit Committee has reviewed and commented on the Revised Annual Report and the Revised Auditor's report. The Committee subsequently endorses the Addendum to the 2012 DSM Audit Summary report and Audit Summary report.

Revised Exhibit List	Exhibit A, Tab 1, Schedule 1
Revised Application	Exhibit A, Tab 1, Schedule 2
Revised Summary of Application	Exhibit A, Tab 1, Schedule 3
2012 DSM Revised Annual Report	Exhibit B, Tab 1, Schedule 1 (Section 6.0 and 7.0)
Independent Audit of 2012 DSM Program Results – Revised Final Report	Exhibit B, Tab 2, Schedule 1
2012 DSM Audit Summary Report	Exhibit B, Tab 3, Schedule 1
Addendum to the 2012 DSM Audit Summary Report	Exhibit B, Tab 3, Schedule 2
Allocation to Revised DSM Variance Accounts	Exhibit B, Tab 4, Schedule 1
IGUA Interrogatory #2	Exhibit I, Tab 3, Schedule 2

Briefly stated, the revised Application is necessitated by the fact that the Application materials, as originally filed, was premised on the understanding that the sum of $30.91 million, being the DSM budget approved by the Board in EB-2011-0295 on February 2, 2012, was the amount recovered in rates when in fact, the amount recovered in rates was the amount approved by the Board in the rate adjustment proceeding for 2012 (EB-2011-0277). This amount was the subject of a Settlement Agreement in that proceeding which was accepted by the Board on December 1, 2011.

This settlement included for ratemaking purposes a DSM budget of $28.1 million. This is the actual amount that was recovered in rates in 2012.

The revisions to the 2012 Clearance Application simply involve making mathematical corrections to the DSMVA to reflect the lower amount actually recovered in rates in 2012. It is also necessary to revise the amounts that will be allocated to each of the various rate classes using the same Board approved allocation methodologies. Importantly, the changes do not impact the audited results of the DSM Programs for 2012 and hence there are no changes proposed, nor is any further auditing required in respect of the amounts proposed to be cleared from the DSMIDA and LRAM accounts. The amounts recovered in rates do not impact the methodologies which underlie these accounts and the audited results.

The Company therefore believes that there should be no issues which should arise as a result of the amendments. It therefore requests a further Procedural Order which provides new dates for the remaining steps 5 and 6 set out in Procedural Order No. 1 dated November 8, 2013 being the date for written submissions from Board Staff and Intervenors and the date for any responding submissions from the Company.

Enbridge reviewed its filing of Interrogatory responses filed on December 6, 2013 and identified that IGUA Interrogatory #2 required a revision. The revised Interrogatory is included in this submission at Exhibit I, Tab 3, Schedule 2.

Please contact the undersigned if you have any questions.

Yours truly,

(Original Signed)

Stephanie Allman
Regulatory Coordinator

Encl.

cc: Dennis O'Leary, Aird & Berlis

EXHIBIT LIST

A - ADMINISTRATION

EXHIBIT	TAB	SCHEDULE	DESCRIPTION
A	1	1	Updated Exhibit List
		2	Application
		3	Summary of Application

EXHIBIT B – EVIDENCE

EXHIBIT	TAB	SCHEDULE	DESCRIPTION
B	1	1	2012 DSM Revised Annual Report
	2	1	Independent Audit of Enbridge Gas Distribution 2012 DSM Program Results – Revised Final Report
	3	1	2012 DSM Audit Summary Report
		2	2012 DSM Audit Summary Report – Addendum
	4	1	Allocation to Revised DSM Variance Accounts

EXHIBIT I – INTERROGATORIES

EXHIBIT	TAB	SCHEDULE	DESCRIPTION
I	1	1 to 11	BOMA Interrogatories to Enbridge
	2	1 to 9	SEC Interrogatories to Enbridge
	3	1 to 3	IGUA Interrogatories to Enbridge

ONTARIO ENERGY BOARD

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

AND IN THE MATTER OF an application by Enbridge Gas Distribution Inc. for an order or orders approving the balances and clearance of certain Demand Side Management Variance Accounts into rates, within the next available QRAM following the Board's approval.

APPLICATION

1. Enbridge Gas Distribution Inc. ("Enbridge Gas Distribution" or the "Company") is an Ontario corporation with its head office in the City of Toronto. It carries on the business of selling, distributing, transmitting and storing natural gas within Ontario. The Company also undertakes Demand Side Management ("DSM") activities.

2. Enbridge Gas Distribution hereby applies to the Ontario Energy Board (the "OEB" or the "Board"), pursuant to section 36 of the *Ontario Energy Board Act, 1998,* as amended (the "Act"), for an Order or Orders approving the final balances in the following 2012 DSM accounts and the disposition of these balances:

DSM Incentive Deferral Account ("DSMIDA")	$8,817,529	
LRAM Variance Account (Reimbursable to Ratepayers)	($40,652)	
DSMVA Amount (Recoverable from Ratepayers)	$2,506,510	/c

3. Enbridge Gas Distribution applies to the Board for such final and interim orders and/or accounting orders as may be necessary in relation to the clearance of the accounts which are the subject of this Application, within the next available QRAM following the Board's approval. The Company further applies to the Board pursuant to the provisions of the Act and the Board's *Rules of Practice and Procedure* for such final and interim Orders and directions as may be necessary in relation to this Application and the proper conduct of this proceeding.

4. The persons affected by this Application are the customers of Enbridge. It is impractical to set out the names and address of the customers because they are too numerous.

5. Enbridge requests that a copy of all documents filed with the Board by each party to this proceeding be served on the Applicant and the Applicant's counsel, as follows:

Mr. Andrew Mandyam
Director, Regulatory Affairs
Enbridge Gas Distribution Inc.

Address for personal service:	500 Consumers Road Willowdale, ON M2J 1P8
Mailing Address:	P.O. Box 650 Scarborough, ON M1K 5E3
Telephone:	416.495-5499
Facsimile:	416.495-6072
E-mail:	EGDRegulatoryProceedings@enbridge.com

The Applicant's counsel:

Mr. Dennis M. O'Leary
Aird & Berlis LLP

Address for personal service and
Mailing address: Brookfield Place, Box 754
Suite 1800, 181 Bay Street
Toronto, ON M5J 2T9

Telephone: 416-865-4711
Facsimile: 416-863-1515
E-mail: doleary@airdberlis.com

Dated: October 23, 2013, at Toronto, Ontario.

ENBRIDGE GAS DISTRIBUTION INC.

Per: (Original Signed)

SUMMARY OF APPLICATION

1. Enbridge Gas Distribution Inc. ("Enbridge" or the "Company") is applying to the Ontario Energy Board ("OEB" or the "Board") pursuant to Section 36 of the *Ontario Energy Board Act, 1998,* as amended ("Act") for an order or Orders approving the final balances in certain 2012 Demand Side Management ("DSM") Deferral and Variance Accounts. The Company is also seeking the disposition of the balances in these accounts and the inclusion into rates, within the next available QRAM following the Board's approval. The accounts which are the subject of this revised Application and the balances recorded are as follows:

DSM Incentive Deferral Account ("DSMIDA")	$8,817,529
LRAM Variance Account (Reimbursable to Ratepayers)	($40,652)
Revised DSMVA Amount (Recoverable from Ratepayers)	$2,506,510
Revised Total Amount Recoverable	$11,283,387

2. The revised net impact of the three 2012 DSM accounts is $11,283,387. The Company seeks approval from the Board for clearance of this amount through to rates in the next available QRAM, pending Board approval.

DSM Framework

3. The deferral and variance accounts which are the subject of this proceeding relate to DSM activities in 2012. This was the first year of operation under the June 30, 2011 DSM Guidelines (EB-2008-0346) ("Guidelines") and the Company's Multi-Year (2012 to 2014) DSM Plan approved by the Board in EB-2011-0295 ("Multi-Year Plan"). The methodologies used by the Company to determine the amounts

recorded in each of the 2012 DSMVA, LRAM, and DSMIDA were the subject of the Guidelines and the approved Multi-Year Plan.

4. The Guidelines and Multi-Year Plan also provided for certain stakeholder consultation, monitoring, and evaluation steps in respect of a year's DSM activities. This included the establishment of an Enbridge Audit Committee ("AC") and a joint Technical Evaluation Committee ("TEC") with Union Gas Limited. This Application summarizes the actions taken by the Company in compliance with same.

Summary of Facts and Events

5. The DSM Consultative elected an Enbridge Audit Committee ("AC") for 2012 consisting of representatives from the Green Energy Coalition ("GEC"), Low Income Energy Network ("LIEN"), and the Canadian Manufacturers & Exporters ("CME").

6. The Company arranged for an independent evaluation of its custom projects. Prior to retaining the independent evaluators, the Company first consulted the TEC about the terms of reference for this evaluation. An agreement was subsequently reached between the Company and the TEC in respect of the terms of reference. The review was completed by independent engineering firms.

7. Consistent with Section 15 of the Guidelines, the Company prepared an evaluation report for 2012 titled 2012 DSM Draft Evaluation Report ("Draft Evaluation Report") dated April 15, 2013, which summarized the savings achieved, the amounts spent and how the results were evaluated. The results of the independent review of custom projects were included in the Draft Evaluation Report which also included calculations for the 2012 DSMIDA and DSMVA.

8. The Guidelines, at Subsection 15.3, requires the Company to subject its DSM results to an independent audit. The Company consulted the AC on the terms of

reference for the audit and the selection of the independent auditor. After consultation with the AC, it was agreed that Energy & Resource Solutions Inc. ("ERS") would be the 2012 DSM Auditor. The Draft Evaluation Report was circulated to the Auditor and AC on April 15th, 2013.

9. The Company consulted the AC on the Audit Work Plan and the reports prepared by ERS. The Auditor verified the calculations underlying the proposed DSMIDA, LRAM, and DSMVA amounts and made various recommendations.

10. The AC subsequently made recommendations respecting the clearance of the DSM variance accounts which were ultimately accepted by the Company, subject to one adjustment to the DSMIDA, as noted further below.

11. In December 2013, Enbridge discovered that the actual amount recovered in rates was $28.1 million, which was the amount approved by the Board in the rate adjustment proceeding for 2012 (EB-2011-0277) on December 1, 2011. The revisions to the 2012 Clearance Application involved making straightforward mathematical corrections to the DSMVA and Rate Allocation; they did not impact the audited results of any DSM Programs for 2012.

12. A copy of the 2012 DSM Revised Annual Report which reflects the post audit results is filed at Exhibit B, Tab 1, Schedule 1.

<u>2012 Demand Side Management Variance Account</u>

13. The revised final DSMVA is the amount of $2,506,510 recoverable from ratepayers.

<u>Lost Revenue Adjustment Mechanism Variance Account</u>

14. The final LRAM is the amount of ($40,652) reimbursable to ratepayers.

DSM Incentive Deferral Account

15. The Guidelines, at Section 11, provide for the method of calculating the DSMIDA and a cap of $9.5 million for 2012, subject to an adjustment to reflect the Company's increased budget for Low Income Programs which raised the cap to $10.45 million. This cap amount will be escalated in future years by the GDP-IPI. The Draft Evaluation Report calculated the DSMIDA at $9,403,559. The Auditor made recommendations with regard to the following measures that the Company and the AC accepted:

    (i) TAPS – Existing Homes

    (ii) Industrial Custom Project Savings

    (iii) Commercial Custom Project Savings

    (iv) Custom Project adjustment factor calculation

    (v) Low income (Part 3) Custom Project Savings

    This resulted in an auditor-recommended DSMIDA of $8,789,917.

Recommendations of the Audit Committee

16. Following its review of the Draft Evaluation Report, the Audit Report, the DSM Revised Annual Report and the Revised Audit report, the AC made the following recommendations regarding the 2012 DSMVA, DSMIDA and LRAM:

    (a) The AC recommended accepting the Company's revised DSMVA calculation of $2,506,510, being recoverable from ratepayers. The Company agrees.

    (b) The AC accepted the LRAM of ($40,652), being reimbursable to ratepayers. The Company agrees.

(c) Regarding the DSMIDA, the AC recommended accepting the Auditor's recommended adjustments. However, during the documentation review process, it was identified that the Auditor's report did not accurately update the CCM savings as part of its proposed revision. Using the corrected data, the DSMIDA was recalculated at $8,817,529. The AC is in agreement with the Company in respect of this correction.

17. The following Table summarizes the claims in the Draft Evaluation Report, the Auditor's recommendations, the post-audit amounts, the DSM Revised Annual Report and the Revised Post Audit Results

	Draft DSM Evaluation Report (April 2013)	Audit Report (June 2013)	Post Audit Results	DSM Revised Annual Report (January 2014)	Revised Post Audit Results
CCM Savings	1,099,083,644m^3	1,068,358,487m^3	1,068,976,932m^3	1,068,976,932m^3	1,068,976,932m^3
DSMIDA Amount Recoverable	$9,403,559	$8,789,917	$8,817,529	$8,817,529	$8,817,529
LRAM (Reimburs-able to Ratepayers)	($38,358)	($40,652)	($40,652)	($40,652)	($40,652)
DSMVA (Recoverable from Ratepayers)	($303,490)	($303,490)	($303,490)	$2,506,510	$2,506,510

18. During the audit, the Auditor verified the calculations underlying the Company's claims regarding the LRAM, DSMVA and DSMIDA. Post audit the Auditor reviewed the revised DSMVA claim. The Addendum to the Revised Audit

Summary Report is filed at Exhibit B, Tab 3, Schedule 2 and the Revised Audit Report is filed at Exhibit B, Tab 3, Schedule 1.

Proposal for Clearance

19. The revised net amount which the Company proposes for clearance through to rates is $11,283,387. The Company respectfully requests that these amounts be included in rates within the next available QRAM following the Board's approval.

20. The allocation methodology applied by the Company was approved by the Guidelines. Specifically, the methodologies applied were:

- The actual DSMVA spending variance amount versus budget targeted to each customer class was allocated to that customer class for rate recovery purposes (Guidelines ss. 13.2).
- The LRAM amount is recovered in rates on the same basis as the lost revenues were experienced so that the LRAM ends up being a full true-up by rate class (Guidelines ss. 13.3).
- DSM shareholder incentive amounts (DSMIDA) already allocated to the rate classes in proportion to the amount actually spent on each respective rate class (Guidelines ss. 13.4).

A breakdown of these allocations is attached at Exhibit B, Tab 4, Schedule 1.

Benefits to Ratepayers

21. The Company's DSM activities in 2012 generated an estimated natural gas savings of approximately 1,069 M CCM.

2012

DEMAND SIDE MANAGEMENT REVISED ANNUAL REPORT

January 10, 2014

ENBRIDGE

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1.0 Executive Summary

The overall goals of Enbridge Gas Distribution's 2012 to 2014 Demand Side Management (DSM) Plan are to help customers achieve deep and lasting energy savings, to capture lost opportunities, and to maximize cost-effective natural gas savings. The Plan is crafted to achieve these goals through a combination of programs within the framework of the Ontario Energy Board's Demand Side Management Guidelines for Natural Gas Utilities (EB-2008-0346), published June 30, 2011 ("Guidelines").

The 2012 Annual Report on DSM program performance assembles the information needed to compare actual to target results, assess effectiveness of delivery, and determine what needs to be changed for subsequent program years. It also details the data used to determine rate adjustments and to calculate the shareholder incentive for DSM activity.

Overall performance of Enbridge's DSM portfolio in 2012 was excellent. Total natural gas savings of 1.07B Cumulative Cubic Meters (CCM) were 21% over target. This was achieved with spending of $30.6M – 99% of budget.

The **Resource Acquisition** program type was a strong performer delivering 22% greater savings than originally forecast with a low average cost of just over $0.0135/CCM and spending at 9% under budget. Commercial and Industrial programs exceeded their savings targets, while collectively, Residential programs came in short at 84% of the savings target. One of the main reasons for this was that some previously successful Residential programs have reached market saturation and are therefore unable to deliver the same magnitude of results seen in previous years.

The Commercial programs contributed 66% of natural gas savings in Resource Acquisition, with custom projects accounting for the largest contribution. Industrial programs contributed 31% of the overall savings. Strong results in these two sectors confirm the effectiveness of Enbridge's Energy Solutions Consultants (ESC's) in building customer relationships. Large projects were major contributors to savings results and this was a

key factor in program costs coming in under budget. A cap on Industrial project funding with a resulting change to the incentive structure was also a factor.

In 2012, the Resource Acquisition program type included innovative programs designed to capture deep savings. This approach proved successful in the Residential markets where a program for older home retrofits met its participation target. However, Commercial and Industrial programs fell short of their targets for percentage of projects delivering energy bill savings of 25% or higher. This shortfall reflected the ongoing economic uncertainty in the province and other barriers to large-scale capital investments.

New programs, Energy Compass and Run it Right, were also aimed at capturing additional savings by moving the Commercial market place towards energy benchmarking and performance-based conservation. Due to the lead-time involved in these projects, program savings results (CCM) will be recorded and reported in 2013.

The **Low Income** programs were delivered to both Residential Single-Family and Multi-Residential sectors. The Single-Family program saw savings 45% greater than target and the Multi-Residential program produced savings slightly below target. The total DSM budget for 2012 included a 10% increase for Low Income programs. At year-end, spending for these programs came in at 14% above budget. The Multi-Residential program cost only $0.03/CCM to deliver and savings achieved under the Single-Family program were more expensive – at over $0.23/CCM. Nonetheless the program met the Total Resource Cost (TRC) screening threshold, and these higher costs were balanced by the associated non-energy benefits the programs bring to these hard-to-reach markets.

Results for **Market Transformation** programs were strong. All programs met or exceeded their targets. There was high enrollment of builders in both the Residential New Construction and Commercial Savings by Design programs, as well as good participation of realtors in the Home Labelling (Rating) program. Overall program spending in Market Transformation was 8% higher than budget. High uptake of the Drain

Water Heat Recovery technology was one factor in the higher costs. Market Transformation programs cannot be assessed with a single cost-effectiveness measure because each has unique metrics that are not based on Cubic Cumulative Meter (CCM) targets.

The 2012 program results have been used to reshape programs and delivery for the 2013 year. Some legacy programs - such as the Residential TAPS and Energy Savings Kits (ESK) programs – have been discontinued. Other programs are being refocused to reflect the transition to market exit (e.g. Drain Water Heat Recovery) or expand coverage (e.g. Community Energy Retrofit). The deep savings metrics for Commercial and Industrial programs will no longer apply in 2013.

An Ontario Energy Board (OEB) approved weighted scoring system was applied to program results in order to calculate the Demand Side Management Incentive (DSMI) corresponding to the Company's 2012 DSM activities. This results in a DSM incentive for 2012 of $8.82M out of a maximum of $10.45 M.

1.1 Introduction and Report Overview

1.1.1 Introduction

Enbridge Gas Distribution Inc. (Enbridge, "the Company", or "EGD") has delivered DSM programs to its customers since 1995 in alignment with the Report of the Ontario Energy Board ("the Board" or "OEB") in EBO 169-III.

In 1999, the Company sought and was granted approval to receive a financial incentive for DSM activities in the form of the Shared Savings Mechanism (SSM). For 2012 and subsequent years the Demand Side Management Incentive (DSMI) replaces the SSM. This new formula complies with the Board's 2011 Demand Side Management Guidelines for Natural Gas Utilities[1] and applies a new system for scoring DSM program results.

In addition, through prior decisions of the Board, the DSM framework includes a Lost Revenue Adjustment Mechanism (LRAM) and Demand Side Management Variance Account (DSMVA). The LRAM "is a mechanism to adjust for margins the utility loses if its DSM Program is more successful in the period after rates are set than was planned in setting the rates."[2] The DSMVA allows the Company to exceed the DSM budget in a given year, provided that the Company meets the Board approved target. It also allows for the return to ratepayers of any unspent budget amounts.

Enbridge's 2012 – 2014 DSM Plan is the result of several years of work. Developed 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.

In June of 2011, the Board released DSM Guidelines for Natural Gas Utilities. These set three central objectives for DSM portfolios: maximize

1 EB 2008-0346, June 30, 2011.
2 EBRO 495, Decision, Page 100

cost-effective natural gas savings, prevent lost opportunities, and pursue deep savings. The Guidelines call for a scorecard approach to measuring DSM programs, setting out metrics appropriate to different programs. The Total Resource Test (TRC) is used primarily as a program-screening tool while program evaluation focuses on cumulative savings, 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 Guidelines required natural gas utilities to submit DSM plans for the period 2012 to 2014 in consultation with stakeholders. During August and September of 2011, Enbridge's extensive consultation with Intervenors resulted in acceptance of new program components and an expanded budget for Low-Income programs. Also an agreement was reached on budget allocation, metrics, and targets for the 2012 program year. The resulting 2012 – 2014 DSM Plan (EB-2011-0295) was approved by the Board on February 9th, 2012.

1.1.2 Report Overview

This report presents the results of the Company's DSM program activities for 2012. The DSM portfolio included the Resource Acquisition program type, Low Income program type and Market Transformation program type. The Resource Acquisition programs and Low Income programs include three major categories of initiatives – prescriptive, quasi-prescriptive and custom. Results for prescriptive and quasi-prescriptive programs are calculated based on the number of units installed together with the deemed savings and related assumptions for specific DSM measures (as approved by the Board in the 2012 – 2014 DSM Plan).

Following the Guidelines, and after consultation with the Technical Evaluation Committee, the utilities submitted in a joint filing by Enbridge and Union Gas an update to the Board to record changes to the assumptions for a selected number of measures (EB-2012-0441 New and Updated DSM Measures). The updated assumptions were approved by the Board on January 31, 2013.

Results for Custom programs are based on calculations for individual sites where efficiency improvements were made. In addition to results from monitoring and tracking, this report incorporates the results of research activities and third party verification.

The report also provides information in support of the Company's 2012 DSMIDA, DSMVA and LRAM claims. The Report is reviewed through an independent audit and the process culminates in the Company filing the DSMIDA, LRAMVA and DSMVA claims with the Board.

The Report is structured as follows:

Section 1	Executive Summary and Introduction
Section 2	Description of Programs
Section 3	Natural Gas Savings CCM
Section 4	LRAMVA Statement
Section 5	DSMIDA Statement
Section 6	DSMVA Statement
Section 7	DSM Rate Allocation and Impact
Section 8	Update on Auditor and Audit Committee Recommendations
Appendix A	TAPS/ESK Verification and Follow-up Studies
Appendix B	Commercial Custom Project Savings Verification Study
Appendix C	Industrial Custom Project Savings Verification Study
Appendix D	Showerhead Verification for Low Income Multi-Residential Buildings
Appendix E	Program Assumptions
Appendix F	Navigant Report – A Sampling Methodology for Custom Commercial and Industrial Programs

1.2 DSM Program Results Summary

Enbridge's DSM portfolio is designed to offer all customer classes access to cost-effective energy efficiency programs and to optimize program results. The 2012 - 2014 DSM Plan uses a scorecard approach for measurement - not only for CCM results but also for other metrics chosen to capture specific program goals. Examples include the number of deep savings projects in the Resource Acquisition program type and the number of builders signed up for Market Transformation initiatives.

1.2.1 Results for 2012 DSM Programs

Budgeted and actual results for 2012 programs are shown in Table 1.

Table 1. 2012 DSM Program Scorecard

	Component	Metric	Weight	Targets			Actual Result
				Lower	Middle	Upper	
Resource Acquisition	Volumes	Cumulative Savings (million m³)	92%	615.3	820.4	1,025.50	1000.86
	Residential Deep Savings	Number of Houses[1]	4%	120	160	200	209
	Commercial-Industrial Deep Savings	Percent Over 25% Bill Savings	4%	40%	45%	50%	25%
Low Income	Single Family (Part 9)	Cumulative Savings (million m³)	50%	12	17	21	24.71
	Multi-residential (Part 3)	Cumulative Savings (million m³)	50%	33	45	56	43.41
Market Transformation	Commercial Savings by Design (New construction)	Builders/Developers Enrolled	20%	6	8	15	9
	Residential Savings by Design (New construction)	Top 20 Builders Enrolled	14.6%	1	2	3	3
		Top 80 Builders Enrolled	14.6%	7	9	18	9
	Drain Water Heat Recovery	# of Units Installed	43.8%	3000	4,000	5,000	5047
	Existing Residential: Home rating @ time of sale	Number of Committed Realtors[2]	7%	N/A	5,000[3]	10,000[3]	8600

1. Number of homes counted towards the Residential Deep Savings Target with a minimum of 2 major measures and at least 11,000 lifetime gas savings and which on average achieve at least 25% reduction in annual gas savings
2. Commitment to make provision for data field to show a home's energy rating for all homes listed by participating realtors (industry-wide commitment to include such a field on MLS or similar listing service and/or individual realtors' commitment to do so with all the homes they list on their own websites, handouts, and other consumer material)
3. Commitment from realtors collectively responsible for more than [5,000/10,000] home listings/year

Table 2. DSM Results – Target versus Actual

Program Sector	CCM Target (100%)	Actual CCM
Residential	43,243,430	36,108,689
Commercial	502,710,045	658,836,828
Industrial	274,500,000	305,915,406
Low Income	62,463,070	68,116,009
Total	**882,916,545**	**1,068,976,932**

Figure 1. DSM Results – Target versus Actual

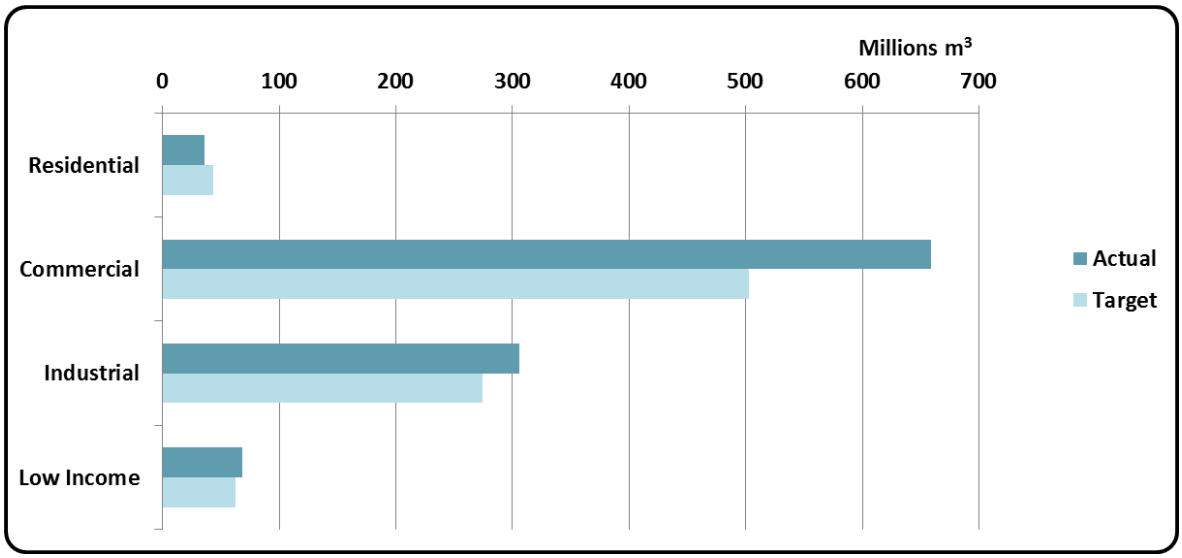


Figure 2: Distributed CCM Savings

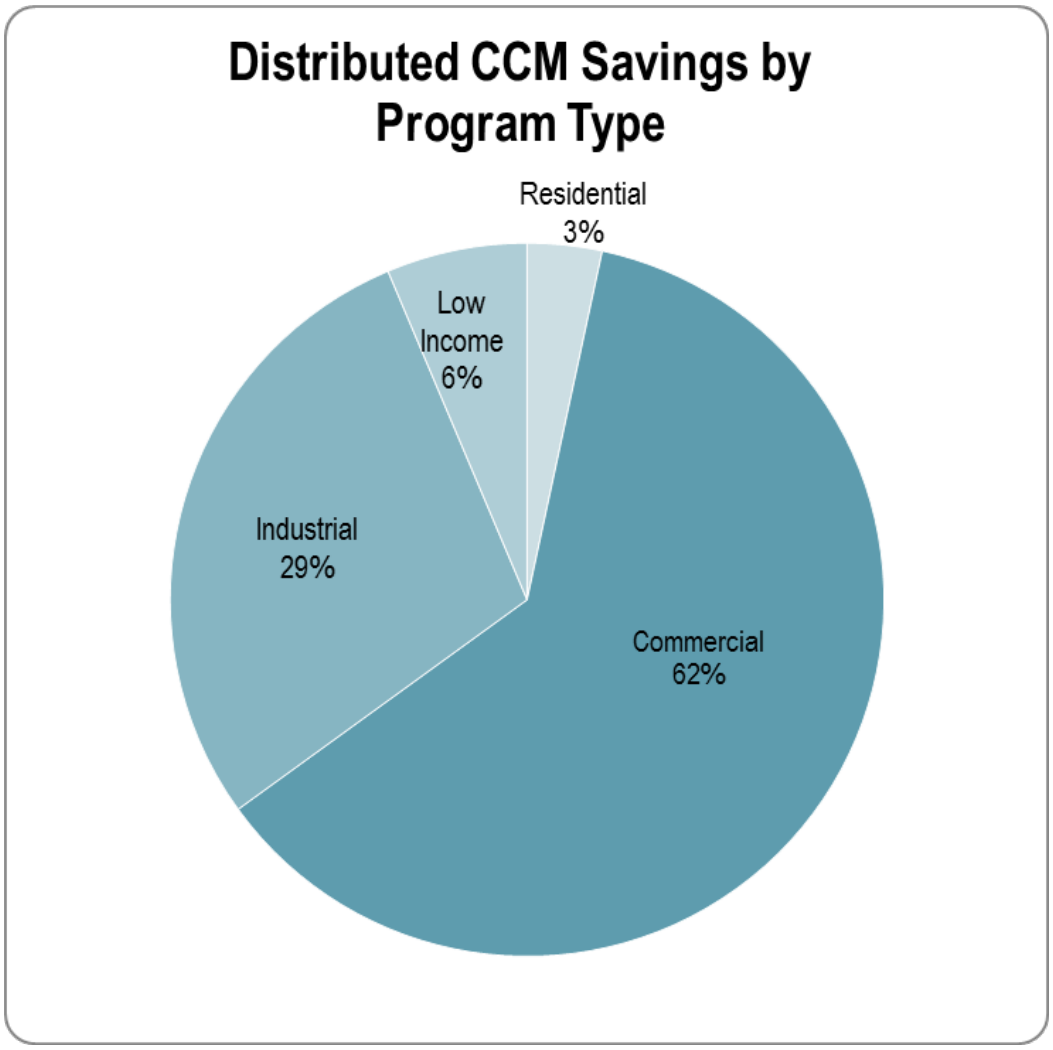


Table 3. DSM Spending – Budget versus Actual

Program Sector	Budget	Actual Costs
Residential	$2,808,000	$2,903,755
Commercial	$8,165,789	$7,960,641
Industrial	$4,151,211	$2,618,877
Low Income	$6,120,650	$7,126,628
Market Transformation	$3,920,000	$4,308,518
Overheads	$5,744,350	$5,688,092
Total	**$30,910,000**	**$30,606,510**

Figure 3. DSM Spending – Budget versus Actual

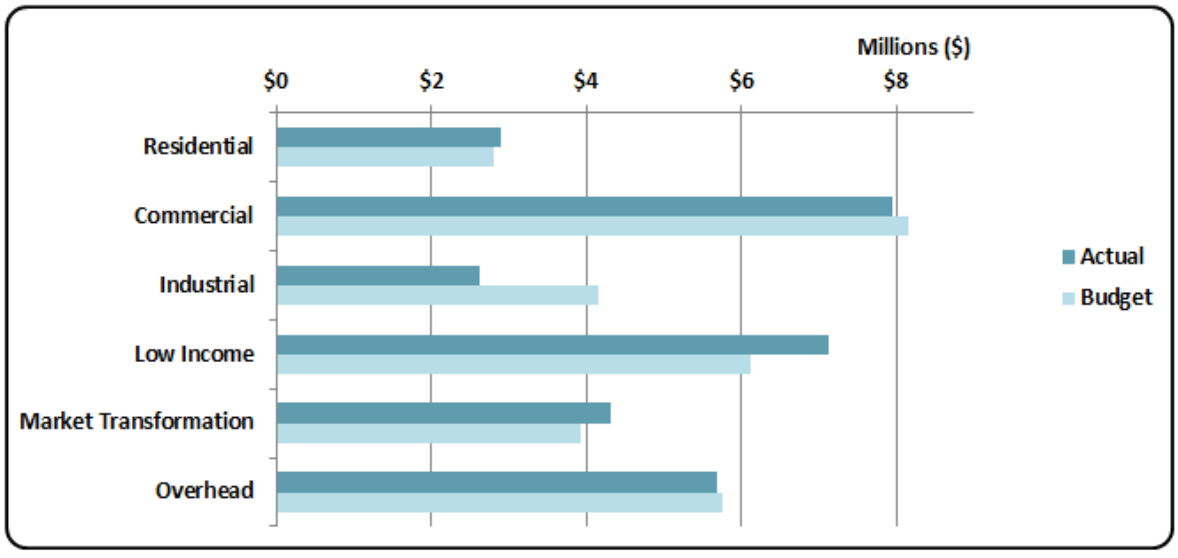
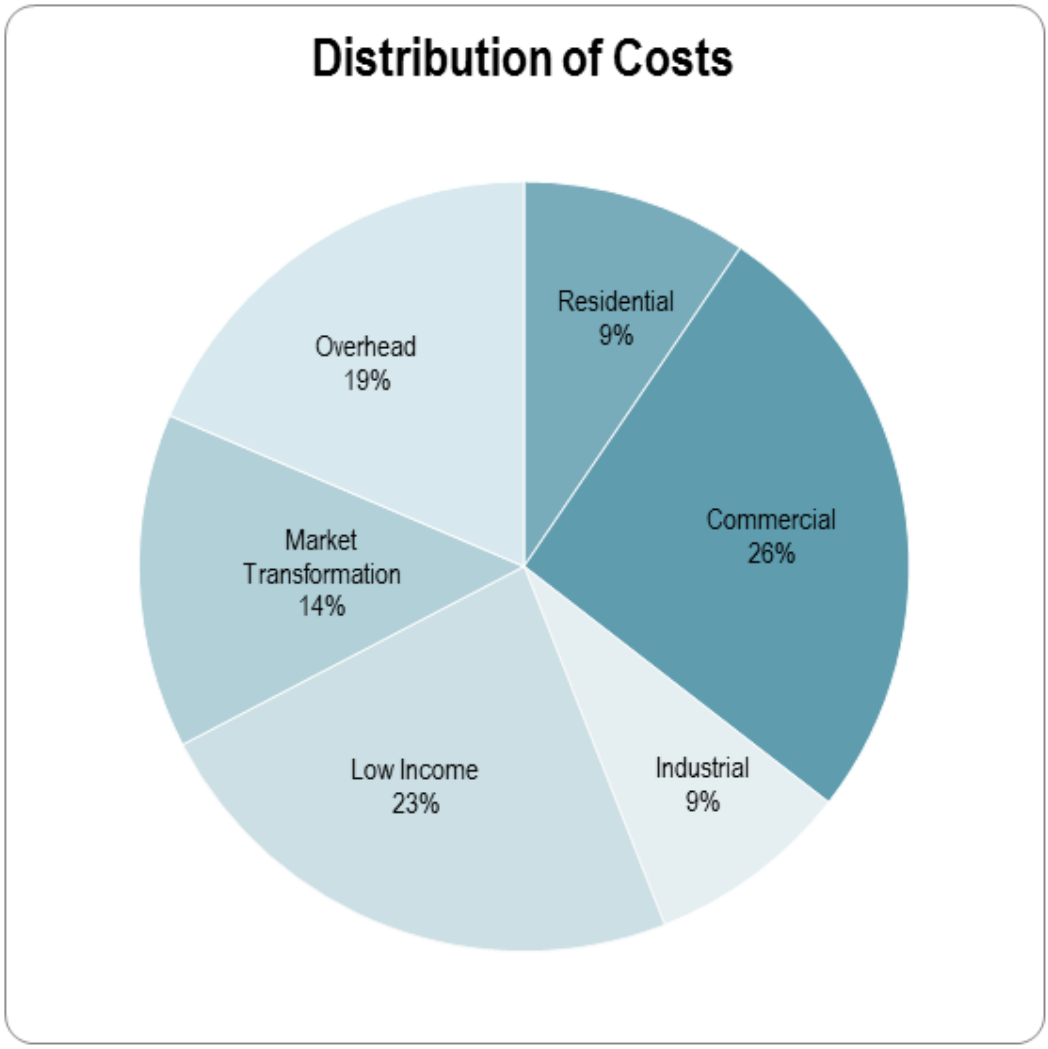


Figure 4. Distribution of Costs



Overall the 2012 DSM portfolio exceeded the savings targets in all program types using Cumulative Cubic Meter savings (CCM) as the program metric.

As can be seen from the Tables and Figures on the previous pages, the Resource Acquisition program type is the largest contributor to natural gas savings. Total Resource Acquisition savings of 1,001M CCM were 22% above the target. Low Income also performed strongly with savings of 68.1M CCM, 9% over target. Commercial programs were the primary

drivers for the portfolio as a whole, with this group accounting for 658.8M CCM, almost 62% of the total DSM results.

The Market Transformation program did not have a CCM target as a metric. However Market Transformation successfully met or exceeded all of the associated middle scorecard targets.

The Low Income and Market Transformation program types were more costly to deliver than anticipated but savings in the Resource Acquisition program type brought overall spending in at 99% of budget.

By agreement with the DSM Consultative and as subsequently approved by the Board in EB-2011-0295, the program results are weighted (see Table 1. 2012 DSM Program Results) and used in the calculation of the Demand Side Management Incentive (DSMI). The detailed calculations and resulting incentive for the 2012 program year are presented in Section 5.0.

2.0 Description of Programs

This section provides an overview of Enbridge's 2012 DSM portfolio, including results in the three major program types: Resource Acquisition, Low Income, and Market Transformation.

Each description includes:

- Overview of program objectives
- Activities associated with the program
- Program highlights
- Program results
- Comments and lessons learned

Performance of the Resource Acquisition and Low Income program types is measured in terms of the number of participants or units installed and the net Cumulative Cubic Meters (CCM) of natural gas savings. The Market Transformation program types are assessed in terms of metrics specific to each program.

The Resource Acquisition program type is grouped into the following three sectors:

- Residential
- Commercial
- Industrial

The Low Income program type falls into two sectors:

- Part 9 Residential existing buildings
- Part 3 Multi-Residential existing buildings

The Market Transformation program type encompasses the following two sectors:

- Residential existing housing
- Residential and Commercial New Construction

2.1 Resource Acquisition Program Type

Enbridge's Resource Acquisition program type for 2012 performed strongly, delivering 22% greater savings than originally budgeted with a low average cost per Cumulative Cubic Meter (CCM) of natural gas savings.

Table 4. Resource Acquisition – Overall Program Results

Program Sector	CCM Target (100%)	Actual CCM	Variance (%)	Cost Effectiveness ($/CCM)
Residential	43,243,430	36,108,689	84%	$0.0804
Commercial	502,710,045	658,836,828	131%	$0.0121
Industrial	274,500,000	305,915,406	111%	$0.0086
Total	**820,453,475**	**1,000,860,923**	**122%**	**$0.0135**

2.1.1 Residential Resource Acquisition

Overview

There are approximately 1.8 million Residential customers within the Enbridge franchise area. This customer base is exclusive to the Rate 1 rate class. Enbridge has been delivering energy efficiency programs to the Residential sector since 1995. These include the TAPS program, High Efficiency Furnace rebate program and the Programmable Thermostat rebate program.

Enbridge's 2012-2014 DSM programs were designed to address new challenges as well as to meet the Ontario Energy Board's DSM Guidelines stressing the requirement to pursue deep savings.

One challenge is that some of the most successful programs in the past have now reached maturity and DSM programs need to address new opportunities. Approximately 70% of the housing stock in EGD's franchise

area is more than 18 years old. These homes tend to consume more energy than those built more recently. A study commissioned by Enbridge indicates that niche markets such as these offer scope for new energy saving initiatives:

> "*As the DSM market matures within Enbridge's franchise area, niche or target markets are becoming increasingly important. For example, measures that may not pass the TRC test in a typical or average application often will pass in niche applications. Air sealing and insulation in older homes (built before 1980) is one example*." [3]

The Residential components of the Resource Acquisition scorecard target the existing home sector. The Residential Community Energy Retrofit Program is a new initiative while the TAPS/ESK programs are mature programs that will be discontinued in 2013.

Table 5. Residential Resource Acquisition Results

Program	Actual CCM	Cost Effectiveness ($/CCM)	Participants/Units Installed
Community Energy Retrofit	5,296,300	$0.1542	271
TAPS	30,812,389	$0.0677	347,964
Total	**36,108,689**	**$0.0804**	**348,235**

The Residential programs in 2012 did not reach their overall savings target, but did achieve their deep savings metrics. (See Tables 1 and 5) The Residential programs accounted for less than 4% of the overall Resource Acquisition program.

3 "Natural Gas Energy Efficiency Potential: Update 2008 Synthesis Report," Marbek Resource Consultants, Ltd. Filed: 2011-11-04 EB-2011-0295, Exhibit B, Tab 2, Schedule 7. Section 3.8, Additional Observations, p.33.

Existing Homes – Residential Community Energy Retrofit

Description: The Community Energy Retrofit (CER) program is designed to pursue deep energy efficiency savings opportunities in older homes. It employs a holistic approach that encompasses not just natural gas measures but also opportunities to save electricity and water.

The program uses Natural Resources Canada's (NRCan) HOT 2000 accredited software as its foundation to calculate the annual gas savings. There is a primary emphasis on deep saving measures including building envelope improvements and mechanical system upgrades as these measures offer the greatest opportunity for long-term energy conservation.

As part of its CER program, Enbridge offered qualifying customers $150 towards the initial audit and up to $1,100 in incentives if the participant completed two of the qualifying measures and achieved at least 550 m^3 in annual gas savings based upon their post audit results.

Enbridge chose the City of Markham as the first community to offer its CER program because of the older housing stock and also because of the city's strong commitment to sustainability through its Greenprint Community Sustainability Plan. The Forward Sorting Area (FSA) - L3P was selected for the launch. With 63% of the houses being between 16 and 35 years old, this area was identified as ideal for the retrofit program. The program was expanded to the entire City of Markham on October 15th, 2012 to further align with their Sustainability Plan. Plans are in place to continue the program in Markham until the end of 2013.

Objectives: The program aims to reduce energy use for space and water heating using a comprehensive approach. This approach encourages conservation through thermal envelope improvements to reduce the space heating load as well as the installation of high efficient equipment.

Highlights: Even though the CER program was launched mid-way through the year (August 2012), it was successful in meeting its scorecard metrics. This success was mainly due to opening up contracts with several

Energy Auditors / Evaluators and engaging the delivery channels to advise HVAC contractors of the program.

Metrics: Deep savings measures offer the greatest opportunity for long-term energy conservation. The program tracked the number of participants (homeowners) completing at least two of the following qualified deep savings measures:

- Building envelope improvements (increasing attic, foundation or exterior wall insulation, air sealing, window replacements)
- High efficiency mechanical system upgrades (installing high-efficiency space and/or water-heating equipment, drain water heat recovery).

Tracking Methodology: The program is tracked and savings are claimed based on results of the HOT 2000 modeling submitted, as determined by NRCan Eco-Energy software and submitted by the Energy Auditors.

Evaluation Activities: The CER program uses Natural Resources Canada's (NRCan's) HOT 2000 accredited software as its foundation to calculate the annual gas savings for each customer.

Program Results: The CER program achieved all scorecard metrics associated with the initiative. A total of 271 households participated and counted toward the CCM target which was three times greater than budget. There were 209 participants that met the 11,000 CCM savings level and contributed to the 25% annual gas saving metric. Overall, 77% of the participants achieved greater than 25% annual gas savings.

Cost-effectiveness: As with many deep savings measures and weatherization initiatives, the 2012 CER program had relatively high cost per Cumulative Cubic Meter (CCM) of $0.1542/CCM savings (CER results were TRC negative with a TRC ratio of 0.62). However the Resource Acquisition program overall was cost effective and TRC positive.

Comments and Lessons Learned:

- ✓ The program was successfully expanded beyond the original FSA area to the whole City of Markham in October 2012.

- ✓ Participation significantly increased when the program was opened up to several Energy Auditors / Evaluators instead of exclusively with Direct Energy. This gave customers more options when choosing an Energy Auditor / Evaluator.

- ✓ Tapping into the HVAC community to promote the program also proved an effective tool to increase awareness and participation.

- ✓ The engagement and program support extended by the City of Markham was invaluable in terms of marketing outreach and strengthened credibility of the program.

Existing Homes – TAPS / ESK

Description: The TAPS program offers a no-charge provision of a variety of water and energy savings measures. The program in 2012 relied on one contractor (TAPS Partner) for delivery and reporting. The participating contractor visited customers' homes to deliver the TAPS Energy Savings Kits (ESK's) and to promote the benefits of the measures and energy efficiency. The customer was provided with two showerheads, two bathroom aerators, and one kitchen aerator for self-installation. The customer was encouraged to visit a micro website to advise EGD that they installed the measures and to enter a contest.

EGD continued to offer mail-in ESK's in 2012. This program was promoted to targeted Residential customers through direct mail and a micro website on the Enbridge Gas Distribution Inc. web site where customers could pre-order the ESK's. Enbridge implemented a targeted marketing effort for each campaign in order to penetrate highly saturated areas where traditional door-to-door marketing was not proving cost-effective.

Objectives: To capture energy savings related to hot water use.

Highlights: The TAPS and ESK programs have been very successful over the past 10 years reaching out to approximately 1.2 million customers. Due to high market penetration the programs have been winding down for the last two years and will not be offered in 2013.

Metrics: The TAPS program results are tracked by the number of participating households. The ESK's are tracked by the number of customer households that received a kit.

Tracking Methodology: Monthly reports from the TAPS contractor delivering the TAPS program and EGD IT reports for ESK direct mail customers.

Evaluation Activities: Three waves and a summative and year-end verification report of TAPS participants were conducted. In addition a year end ESK Verification Report sampling direct mail participants was also completed.

Program results have been adjusted to reflect the removal/non-install rates.

The TAPS and ESK Verification and follow-up studies are summarized in Appendix A.

Program results: The TAPS/ESK programs delivered overall savings of 30.8M CCM with 347,964 units delivered.

Cost-effectiveness: The TAPS / ESK program has traditionally been a very cost-effective program generating high TRC values. Despite the high removal and non-install rates seen in 2012 this program still proves to be cost-effective at $0.0677/CCM.

Comments and Lessons Learned:

- ✓ The TAPS program has been delivered to close to 70% of the existing residential customer base.

- ✓ As a part of the defined exit strategy, the contractor direct-install stream of the TAPS program was phased out in 2011.
- ✓ In 2012 EGD continued with door-to-door delivery of an ESK kit and a targeted direct mail campaign, both for self-install.
- ✓ Given the high market saturation, the program has been discontinued and will not be offered in 2013.

2.1.2 Commercial Resource Acquisition

Overview

Table 6. Commercial Resource Acquisition Results

Program	Actual CCM	Cost Effectiveness ($/CCM)	Participants/Units Installed
Commercial Custom	251,714,332	$0.0188	490
Commercial Prescriptive	47,373,803	$0.0040	1,417
New Construction	134,925,548	$0.0051	70
Multi-Res	224,823,144	$0.0104	8,775
Total	**658,836,828**	**$0.0121**	**10,752**

Enbridge offers a variety of incentive-based initiatives to Commercial sector customers primarily in Rate classes 6, 135 and 145. These initiatives include custom project incentives and a suite of prescriptive and quasi-prescriptive incentives aimed at promoting specific measures.

Enbridge uses a combination of custom project funding and prescriptive measure incentives as a way of presenting a range of energy efficiency options to all Commercial customers.

Enbridge also uses marketing initiatives to target certain segments within the Commercial sector - Schools and Food service for example. These approaches have been successful in the past. Combined with support for business partners that deliver energy efficiency (building auditors, consulting engineers, training institutions), the programs promote both customer demand and industry supply of energy efficiency products and services.

The Company continues to develop new marketing initiatives to drive results for Commercial customers. These include the Energy Compass program launched in 2011 and the Run It Right program launched in 2012.

Commercial programs in 2012 exceeded the targets for savings, except for the deep savings target, which is discussed further in the Comments section. As detailed in Table 6, the Commercial sector contributed almost 659M CCM to Resource Acquisition results (66% of the total).

The programs overall were cost-effective to deliver, resulting in significant natural gas savings at an average cost of $0.0121/CCM.

Commercial – Custom

Description: The Custom program is available to all Commercial sector customers across the following categories: Multi-Residential privately owned[4], Office, Hospital, Schools, Hotel/Motel, Warehouse, Municipality, Retail, Long-term care, and New Construction.

The Custom Commercial program offers customers in the target segments incentives for third-party energy audits, equipment retrofits and operational improvements. Measures include capital improvements such as boiler and HVAC retrofits, building automation systems, building envelope improvements, and steam trap replacement.

As trusted energy advisors, the Company's Energy Solutions Consultants (ESC's) are key to the program's success because of their valuable technical and sales skills. The ESC's maintain contact with customers and business partners – Commercial HVAC contractors, engineering firms, designers and others who serve the Commercial markets. They provide advice on customized energy solutions to suit the customer's business needs.

Programs are promoted through direct customer contact with building owners/operators, representation at numerous key industry tradeshows, speaker engagements and event sponsorships, on the Company's website as well as through e-marketing and print material (e.g. case studies and magazine articles) and direct mail.

The Commercial New Construction offering was re-designed in 2012, with the launch of a major market transformation initiative focusing on Integrated Design Process (IDP) and Savings by Design (SBD) program.

The predecessor to this program was the Design Assistance Program (DAP) and New Building Construction Program (NBCP). The DAP encouraged building developers, architects and engineers to evaluate

4 The Mutli-Res Projects referenced in this section include custom multi-res projects as well as multi-res showerhead results.

energy efficiency measures at the building design phase. The NBCP was a follow-on program that provided an incentive for the building owner to implement the energy efficiency measures identified at the design stage. During this transition to IDP and SBD, EGD delivered the NBCP in 2012 for customers that participated in the original DAP program. The Company expects a small carryover of NBCP projects into 2013.

***Objectives**:* To capture energy savings in the commercial segment through retrofits of building components, upgrades at time of replacement, and ongoing maintenance and related activities. The program also aims to promote the highest level of energy efficiency.

Highlights: The Commercial Custom program continues to be the largest contributor to the overall resource acquisition results in the Commercial sector. The relationships ESCs have developed with customers and business partners have been an important factor in the program's success and will provide a solid foundation for future efforts.

Metrics: The main program metric is Cumulative Cubic Meters (CCM) savings as determined by the number of projects, annual savings and measure life per project. There is also a deep savings metric – the percent of projects that achieve savings of over 25%.

Tracking Methodology: The savings for each customer project are calculated on an individual basis. These are tracked monthly utilizing EGD's sales tracking software.

***Evaluation Activities**:* A third party engineering review was conducted of a random sample of projects from the Commercial sector. The Commercial Custom Project Savings Verification (CPSV) is found in Appendix B. Reported results include adjustments as recommended by the engineering review.

Program Results: Custom type projects accounted for over 92% of total Commercial Resource Acquisition CCM results.

The New Construction sector contributed 134.9M CCM in 2012, over 20% of the total Commercial results. The successes of the New Building Construction Program (NBCP) were generated at the building design stage with EGD's Design Assistance Program (DAP) one to two years earlier. The DAP program provides funding at the design stage and there is a lag time from initial project scoping to construction. ESC's work with owners, engineers and architects throughout the project to encourage maximum implementation of energy efficiency measures identified at the design stage.

The Multi-Residential projects (custom and showerheads) contributed 224.8M CCM or 34% to the overall results in the Commercial sector.

In 2012, 25% of projects achieved 25% or higher energy savings. Although this result does not meet the lower target set in the plan (40%), it still represents a significant accomplishment as discussed in the Comments section.

Cost-effectiveness: These programs are among the most cost-effective in the DSM portfolio, delivering significant natural gas savings of $0.0051/CCM in New Construction, $0.0104/CCM in Multi-Res and $0.0188/CCM in other Custom Commercial.

Comments and Lessons Learned:

- ✓ The Commercial Custom program has delivered significant cost-effective savings and is a major contributor to the Resource Acquisition program.

- ✓ Strong ESC relationships with customers, stakeholders and the contractor community are critical to success. These individuals and organizations place a great deal of value on the support they receive from Enbridge: savings calculations, equipment verification, energy data and the value of the Enbridge brand. Incentive support of a technology retrofit is an implicit endorsement that makes customers more comfortable in their decision-making. It reduces their perception of risk to initiate a project.

- ✓ 2012 saw a continuing trend toward solid savings results in the Multi-Residential, Office and Schools segments, with Multi-Residential having particularly strong results. We are seeing good results from targeted sales efforts in sectors, such as Retail, which have historically been difficult to reach and have been under-represented. The Commercial-wide technology promotion for Demand Control Ventilation and Variable Frequency Drive provided overall strong results for Commercial, with good penetration in the Multi-Residential and Retail sectors.

- ✓ Influencing 25% of the Commercial customers to achieve greater than 25% energy savings can be considered a significant accomplishment. Although Enbridge always encourages customers to aim for the highest level of energy efficiency, this is not always technically feasible. Even when it is technically feasible, some energy efficiency (DSM) projects do not meet customers' internal financial hurdle rates; in other cases, customer budget constraints limit how much they are able to spend on DSM projects in one year.

Commercial – Prescriptive

Description: The Prescriptive program is available to all Commercial sector customers across the following categories: Multi-Residential privately owned[5], Office, Hospital, Schools, Hotel/Motel, Warehouse, Municipality, Retail, and Long-term care.

The Prescriptive Commercial program in 2012 offered incentives for various prescriptive and quasi-prescriptive measures including: high efficiency boilers, condensing boilers (under 300 mbh), ENERGY STAR dishwashers, ENERGY STAR fryers, ENERGY STAR steam cookers, high efficiency under-fired broilers, energy recovery ventilators (ERV), heat recovery ventilators (HRV), infrared heaters, demand control kitchen ventilation, ozone commercial clothes washers, showerheads, and air doors.

The measures have been promoted through representation at numerous key industry tradeshows, speaker engagements, event sponsorships, the Company's website, e-marketing, print material (e.g. case studies and magazine articles) and direct mail. New in 2012 was an effort aimed at engaging the various distributor networks and encouraging them to promote the various technologies.

Objectives*:* The program aims to capture energy savings in the Commercial sector through installation of prescriptive technologies.

The program uses broad scale marketing approaches in order to reach a broader customer base and achieve higher market penetration than would be possible with the direct contact approach used by the Commercial Custom program.

Highlights: The Prescriptive program is gaining traction in the marketplace. Engagement of the various delivery channels and distributor networks is proving effective. Sector-based outreach and marketing has

5 Excludes multi-res showerheads.

been effective in markets such as Restaurants, Warehouses (air doors), Multi-Residential and Commercial laundries.

Metrics: The main program metric is Cumulative Cubic Meters (CCM) savings.

Tracking Methodology: Monthly tracking process of participants utilizing EGD's sales tracking software.

Evaluation Activities*:* Results for the Multi-Residential Showerhead program were adjusted based on reduction factors for 2011.

Program Results: The Commercial Prescriptive program contributed 47.3M CCM or 7% to the overall Commercial results.

Cost-effectiveness: The Commercial Prescriptive program continues to deliver significant cost-effective savings of $0.0040/CCM and contributes to the overall cost-effectiveness of the Resource Acquisition program.

Comments and Lessons Learned:

- ✓ The general market approach is to promote the Prescriptive program through various marketing activities as previously discussed. In 2012, a portfolio-based marketing approach was used including an emphasis on specific campaigns.

- ✓ Basic program information was summarized into easily distributed sets of brochures. The various intake forms were merged into one prescriptive incentive form included in the brochures. This simplified the offering into a single communications piece and provided easier distribution, streamlined tracking, and more efficient processing.

Commercial – Energy Compass and Run it Right (RIR)

Description: Both the Energy Compass and Run it Right initiatives are designed to move the commercial marketplace towards performance-based conservation. They include:

- Continuous improvement
- Data driven decision making
- Monitoring and reporting on actual overall energy savings

These programs encourage Commercial customers to make data-driven decisions in order to capture energy savings. The acquisition and analysis of detailed energy data allows building operators and managers to make strategic data-driven decisions regarding energy savings and capital investments.

Energy Compass provides a cost-effective way to rank buildings on several key parameters (e.g.; Area, Occupancy, Age, Number of floors, and Number of suites).

Participation in the Energy Compass program assists customers in better understanding their highest and lowest performing buildings. This allows:

- Consumption data analysis of buildings within a portfolio
- Energy intensity benchmarking for each building
- List of past EGD capital incentives and list of recommended upgrades based on EGD initiatives provided for each building

Participation in the Run It Right program was targeted to large volume customers. RIR leads participants to data-driven decision-making through:

- Energy intensity benchmarking for building portfolios
- Operational improvements – low cost/no cost in nature
- Performance-based m^3 savings
- Data analysis
- Building operator training
- Access to daily gas consumption information

Enbridge assists customers in knowledge development, opportunity identification, measurement, as well as with action and implementation.

Highlights: The Commercial Custom program continues to be the largest contributor to overall Resource Acquisition results in the Commercial sector. The Energy Compass and RIR programs strengthen the ESC's offerings to business partners. They provide an important part of the program's reach and approach in the Commercial sector and a foundation for future efforts in this sector.

Objectives*:* Recruit building owners to improve the energy performance of buildings in their portfolio through in-house benchmarking and continuous operational improvements. This includes support for energy monitoring services and related analysis, re-commissioning, and energy savings opportunity assessments. Lead customers to data-driven decision making through continuous improvement initiatives.

Metrics: As per EB-2011-0295, for Run it Right, the average cost and savings per participant will be reported in 2013, as a result of the operational measures that were implemented in 2012.

Tracking Methodology: For Run it Right, bi-monthly tracking process of participant's savings utilizing EGD's sales tracking software. Savings are being monitored; however final results will not be available until a full year after implementation of all the operational improvement measures. Savings calculations are based on actual metered data.

Program Results: Program savings results (CCM) will be recorded and reported in 2013. In 2012, 201 participants enrolled in Run it Right. In 2012, Energy Compass had 301 participants representing 7 portfolios.

Cost-effectiveness: Energy Compass is considered a cost-effective program. Run it Right program savings results (CCM) will be recorded and reported in 2013, therefore cost-effectiveness of $/CCM will not be realized until the end of 2013. Since the program offers newer services in the market, a relatively higher $/CCM is expected.

Comments and Lessons Learned:

- ✓ Commercial customers are very appreciative of the technical support provided by EGD Energy Solutions Consultants.

- ✓ The $1.9M Run it Right budget was under spent in 2012 due to a number of contributing factors. Because the program extends over two years with a monitoring period of twelve months, much of the reporting will be completed in 2013. The average re-commissioning or implementation amount paid to customers was less than the expected $5,000 incentive offered and budgeted. Additionally, a number of customers that had committed to participate in the program dropped out late in the year.

- ✓ As part of the Run it Right program in 2012, the Company provided customers and their contractors with a list of suggested potential operational improvement measures as a guide to select from. There will be a continued effort to provide an even greater level of input into this process in order to optimize customer savings.

- ✓ In 2012, an incentive of up to $5,000 was offered for Run it Right participants. This incentive level was not appropriate across all customers in varying segments. Incentive levels are being revisited for 2013 based on building complexity and consumption in order to stimulate more customer uptake.

2.1.3 Industrial Resource Acquisition

Description: Enbridge's DSM program for Industrial customers encompasses the Continuous Energy Improvement (CEI) initiative as a custom project offering.

This program employed a three-pronged approach aimed at providing a complete solution to the customer's energy needs:

1. Energy Solutions Consultants (ESC's) helped customers identify and prioritize opportunities to conserve and reduce energy use, and provide assistance in implementing energy improvement projects. Staff assisted customers through the entire process – from identifying opportunities and quantifying savings through measurement and calculations, to connecting with business partners and coordinating other program supports.

2. Energy Assessments – These assessments helped identify opportunities, quantify savings, and build a roster of potential projects. Enbridge funded up to 50% of the cost of an energy assessment. ESCs helped coordinate these assessments including helping to develop the scope of the study.

3. Project Incentives – Enbridge provided incentives towards energy efficiency projects. This helped both to reduce the capital cost and also gave the customer confidence that the savings would be realized.

Enbridge continued to provide education and training activities that supported energy efficiency adoption and energy conservation. In 2012 Enbridge conducted workshops designed to educate customers and business partners on energy matters and the value that energy efficiency and energy conservation can bring to their businesses. Enbridge also offered a training session for its business partners and interested customers on ISO 50001.

Highlights: There were significant challenges to implementing the program in 2012. Although the Industrial sector showed signs of economic recovery, manufacturers still struggled with the high Canadian dollar and

intense competition from other suppliers. The sector lacked staff to implement energy efficiency projects and these projects faced very high financial justification due to limited capital. The low cost for natural gas was also a large barrier to implementing efficiency improvements as it lengthened the project payback period.

The 2012 Industrial sector did have an increase in results over last year. However this was primarily due to one extremely large project. While the Industrial sector typically has large projects, this one was much bigger than the historic norm. Without it, the Industrial sector would not have achieved its target.

In an effort to ensure that budgets were not exceeded in specific Rate classes, Enbridge offered the implementation incentive of $0.07/m^3 of natural gas saved to a maximum of $75,000 per project in Rate classes 110, 115 and 170. The other Rate classes served in the Industrial sector, 6, 135, and 145 received an implementation incentive of $0.15/m^3 of natural gas saved to a maximum of $75,000.

The Small Industrial sector has always been difficult to reach with efficiency programs. This sector has the same needs as the Large Industrial customers, however their size makes the economics of EGD's existing programs difficult to justify. In an effort to address these issues, EGD launched a new component within the Industrial sector – the University program which targets these smaller Industrial customers. The University program utilized engineering students under the tutelage of an engineering professor and EGD Energy Solutions Consultant (ESC) to perform energy assessments and audits to identify energy saving potential.

As in the previous years, the Industrial DSM program continued to face challenges from other energy efficiency programs. Electric Conservation and Demand Management (CDM) programs are becoming more established in the marketplace. Enbridge currently provides the lowest level of incentives compared to the electricity CDM programs.

***Objectives**:* To capture energy savings in the Industrial sector through the delivery of custom energy solutions aimed at continuous improvement.

Metrics: The main program metric is Cumulative Cubic Meters (CCM) savings as determined by the number of projects and associated per project savings. There is also a deep savings metric – the percent of projects that achieve savings of over 25%.

Tracking Methodology: The savings for each customer project are calculated on an individual basis, then tracked monthly utilizing EGD's sales tracking software.

***Evaluation Activities**:* A third-party engineering review was conducted of a sample of projects from the Industrial sector. The Industrial Custom Project Savings Verification (CPSV) is summarized in Appendix C. Reported results include adjustments as recommended by the engineering review.

Program Results:

Table 7. Industrial Resource Acquisition Results

Program	Actual CCM	Cost Effectiveness ($/CCM)	Participants/Units Installed
Industrial	300,427,558	$0.0085	79
Agricultural	5,487,849	$0.0109	12
Total	**305,915,406**	**$0.0086**	**91**

The Industrial programs contributed 305.9M CCM to the overall Resource Acquisition CCM result of 1,001M CCM, or almost 31% of the results. These results include one large project which accounted for 92.8M CCM or 30% of the overall Industrial CCM results.

The Industrial sector, as was the case in the Commercial sector, did not meet the deep savings metric, with 25% of projects achieving 25% or higher energy savings. Although this result does not meet the lower target set in the plan (40%), it still represented a significant accomplishment as discussed in the following Comments section.

Cost-effectiveness: The Industrial program delivered very cost-effective results.

Savings in the program were realized at a cost of only $0.0086/CCM. The very low cost per CCM for 2012 is partly due to the budget being underspent. There are two reasons for this. First, 2012 had a greater number of large projects than previous years including a single large Industrial project that was far outside of EGD's normal project distribution. The result is a lower cost per CCM due to EGD's incentive cap. This one large project alone contributed to almost 93M CCM at a cost per CCM of less than one-quarter of the previous average.

Secondly, upward pressure on the cost-effectiveness and budget due to the higher costs of delivering initiatives to the small industrial market was expected. While EGD increased incentive rates at the beginning of the year, the outreach programs took place much later or were not yet launched in 2012. The University program did not have its first audit until September and some of Enbridge's small industrial targeted initiatives and campaigns are only launching in 2013.

Comments and Lessons Learned:

- ✓ Process related projects remain the largest end use technology as a portion of the overall sector performance.
- ✓ EGD's Industrial programs are designed to primarily counter (1) knowledge barriers such as education and awareness (2) technical and business justification barriers to energy efficiency adoption and (3) financial barriers related to quantification and implementation of energy efficiency measures.
- ✓ Interest in and need for metering, measurement and data based decision making types of initiatives are growing in terms of number of participants

and use of data in developing the business case for energy efficiency projects.

- ✓ Due to the complexity and composition of Industrial processes the deep savings metric was not met in the Industrial sector. With Industrial processes it is difficult to reduce by 25% in a one-year period. In some cases, Industrial customers simply cannot commit the capital expenditure that would be necessary to reduce bill savings by 25%.

- ✓ As filed in the EGD 2013-2014 DSM Plan Update (EB-2012-0394), the deep savings metric will not be included in the 2013 and 2014 Resource Acquisition scorecard. This metric can discourage the promotion of new and innovative technologies. A new technology, although very applicable to the customer, will often not achieve 25% savings. This created a conflict in the development of new initiatives and technologies.

- ✓ Overall industrial projects are slower to develop, so there will potentially still be some lag in results (and thus variable spend) even once the initiatives are launched.

- ✓ In 2012, EGD made gains in reaching out to the traditionally hard-to-reach Small Industrial sector. EGD will continue its focus on Small Industrial customers by pursuing initiatives such as the University program, and dedicating internal resources to support the customers in this smaller Industrial market.

2.2 Low Income Program Type

Low Income programs for 2012 performed well relative to their targets. Cumulative natural gas savings were 68.1M CCM (9% over target).

Overview

Low-income households are often less energy efficient than others, yet difficult to reach with traditional DSM programs. Programs in this sector need to be designed and delivered differently to encourage customer awareness, access and participation. Two Low Income program streams target different segments of these markets, Single-Family Buildings (Part 9) and Multi-Residential Social Housing Buildings (Part 3).

In 2012, the Enbridge Weatherization program was offered to tenants and homeowners meeting the eligibility criteria of 135% of Statistics Canada's Low Income Cut-off (LICO) measure and/or a recipient of social benefits or social housing. The Low Income TAPS program was combined with the Weatherization program to offer a full suite of thermal envelope improvement and water conservation measures. The program was delivered by community-based organizations with strong links to social service agencies. Those participating in the program were, and continue to be, referred to the electricity conservation weatherization program.

The Multi-Residential program addresses comprehensive energy efficiency needs in social housing buildings by offering direct installation of energy saving measures as well as financial support for custom retrofits such as boilers, thermal envelope improvements, and controls.

Both program sectors result in natural gas savings tracked as program metrics. As an added benefit, certain measures also deliver substantial water and electricity savings. Table 8 shows the scorecard targets.

Table 8. Low Income Targets and Results

	Component	Metric	Weight	Targets			Actual Result
				Lower	Middle	Upper	
Low Income	**Single Family (Part 9)**	Cumulative Savings (million m³)	**50%**	12	17	21	**24.71**
	Multi-residential (Part 3)	Cumulative Savings (million m³)	**50%**	33	45	56	**43.41**
			Total	45	62	77	**68.12**

2.2.1 Single-Family (Part 9) Buildings

Weatherization

Description: The Weatherization Program is available to qualified Low Income Residential, Part 9 building (3 stories or less) tenants and homeowners within the EGD franchise who meet the program's income eligibility criteria.

Delivery agents perform energy audits to determine the most cost-effective measures appropriate for each home. Measures may include attic, wall and basement insulation, door and window caulking, and draft proofing. An initial home visit is made to determine if the home qualifies for TAPS. Homeowners are offered a programmable thermostat and low-flow showerheads as well as kitchen and bathroom aerators. Participants are also referred to the electric utility's home weatherization program. In 2012 Enbridge contracted with the following service providers: GLOBE, GreenSaver, Green Communities and Envirocentre. All have extensive experience in energy efficiency audit and retrofit delivery activities and are entrenched in the communities that they serve.

Objectives: The main objectives in 2012 were to expand the reach of the Weatherization program and provide greater energy savings to participants. This was accomplished through improvement of the thermal envelope and other measures that reduced the energy needed for space and water heating, and expansion of the program to Part 9 social housing buildings regardless of bill payment responsibility, i.e. homes where the housing provider paid gas bills could access the program.

Highlights: The program was an outstanding success. Significant savings were mainly driven by the participation of social housing providers: Toronto Community Housing Corporation; Ottawa Community Housing; Simcoe and York Housing. Their program delivery reached just over 800 households accounting for 70% of the total CCM for the Low Income Weatherization program.

Metrics: The main program metric is Cumulative Cubic Meters (CCM) savings.

Tracking Methodology: Contractor reports summarizing participant numbers and natural gas savings (m^3) calculated based on the results of the energy audits conducted by energy auditors on a customized basis. Participation is also tracked by ownership, i.e. social housing or privately owned dwellings.

Table 9. Single-Family (Part 9) Low Income Results

Program Segment	Actual CCM	Cost Effectiveness ($/CCM)	Participants/Units Installed
Single Family (Part 9)	24,708,220	$0.2331	1,107

Program Results: The Weatherization program was very successful – with actual cumulative savings of 24.7M CCM exceeding the target in the DSM Plan of 17M CCM by over 45%.

Cost-effectiveness: Gas savings were achieved at a cost $0.23/CCM in this program. Low income programs such as these are typically among the most expensive to deliver on a cost per CCM basis.

Comments and Lessons Learned:

- ✓ The Low Income sector continues to pose unique challenges in accessing this target market through traditional activities. Inherent financial barriers, frequent substandard housing conditions, and poor customer awareness and access has required targeted and specific outreach activities as well as direct installation of program measures. Partnering with identified delivery agents and social agencies to promote low-income initiatives to customers will continue to be a key component in successfully reaching this market.

- ✓ In delivering the Weatherization program for the past six years, Enbridge has been able to reach many different types of single family dwellings - detached, semi's, townhouses and row houses, including many older, larger "energy inefficient homes". With the expansion of the program this past year to include the social housing segment, which very often includes, smaller townhouse or row house type dwellings~~,~~ the average savings per home has gone down in 2012. Delivery agents who focus on privately owned low income customers will continue to be an important focus for the provision of the weatherization program throughout the Enbridge franchise area, however, the growing participation of the social housing providers and a higher proportion of these smaller dwellings will continue the trend towards lower average savings per home.

- ✓ Weatherizing smaller homes does not necessarily equate to lower cost of implementation. Additional marketing activities are required to reach out to these potential customers and add to program marketing and transactional costs. Continuing collaboration with electric utilities delivering low-income programs may slightly improve overall program efficiencies in the future.

- ✓ In the Social Housing sector the scheduling and coordination of the actual work with the head office/site personnel and residents can be very challenging.

2.2.2 Multi-Residential (Part 3) Buildings

Retrofit

Description: The Low Income Multi-Residential Retrofit Program assists social housing providers to improve the energy efficiency of their aging buildings. The program takes the building as a system approach to energy efficiency. It targets housing providers, building operators and tenants with a range of measures including enhanced financial incentives, technical information services, building assessments/audits, education, and project facilitation. Education and community sector sponsored outreach are also essential components.

Social housing proponents were engaged to deliver and implement the program. GLOBE, a subsidiary of the Housing Services Corporation (HSC), formerly known as Social Housing Services Corporation, was contracted to deliver the social housing stream of both the Residential Weatherization and Multi-Residential Retrofit programs.

There are numerous barriers that discourage low-income customers and social housing providers from investing in energy efficiency and DSM programs. The Low Income Multi-Residential program has been designed to address these barriers.

Financial barriers are addressed by increasing financial incentives of the standard offer Multi-Residential custom program incentive from $\$0.10/m^3$ saved to $\$0.20/m^3$. Increasing the incentive to this level will help close the gap between standard and high efficiency alternatives.

Technical issues are addressed by providing a comprehensive program package that includes benchmarking, energy audits, technical assistance, and project facilitation services by sector experts.

Objectives: To capture energy savings with water and space heating measures as well as thermal envelope improvements.

Highlights: The program was close to meeting its natural gas savings targets in a cost-effective manner, as discussed in the Comments section.

Metrics: The main program metric is Cumulative Cubic Meters (CCM) savings.

Tracking Methodology: As with Commercial Custom projects, the savings for each customer project are calculated on an individual basis. Additionally, savings per unit installed for low-flow showerheads are tracked and totalled. The program undergoes a monthly tracking process utilizing EGD's sales tracking software.

Evaluation Activities: A third-party engineering review was conducted of sample projects from the Commercial sector. The Commercial Custom Project Savings Verification (CPSV) summary can be found in Appendix B. As well a Low Income Showerhead Verification study was completed which included site visits to a random sample of Multi-Residential buildings to verify the persistence level of claimed showerheads. A summary can be found in Appendix D.

Program Results: Program results as reported include adjustments from the verification studies.

Table 10. Multi-Residential (Part 3) Low Income Results

Program	Actual CCM	Cost Effectiveness ($/CCM)	Participants/Units Installed
Multi-Residential (Part 3)	43,407,789	$0.0315	12,267

The Multi-Residential program showed strong results for 2012. Cumulative cubic meter natural gas savings were only slightly below the amount targeted, achieving 43.4M CCM versus a target of 45M CCM. There were 57 social housing buildings participating in the program. Of these, 15 participated in the building performance management initiative (RIR).

Cost- effectiveness: Cost-effectiveness for this program averages $0.0315/CCM.

Comments and Lessons Learned:

- ✓ Over the past few years the social housing sector has benefitted from a 'rich' stimulus fund (the Social Housing Energy Retrofit Program) which ended in 2011. This means that many capital replacement projects, such as HVAC and other mechanical retrofits and building envelope improvements, have already been undertaken. In addition, program fatigue has also set in, along with sector pressing issues such as health and crime prevention, making it more difficult to get the attention of the social housing providers to participate in energy efficiency programs.
- ✓ Given this, there is an opportunity to promote benchmarking and operational improvements initiatives to the sector. This will make it possible to optimize the use and efficiency of newly acquired equipment.
- ✓ Through its internal processes EGD identified that one service provider had purchased 2-gallon per minute (gpm) showerheads rather than 1.25 to 1.5 gpm. As it was not feasible to alter the purchase of these units or the installation of the showerhead units, the savings were recalculated. This contributed to a lower total savings than previously expected for this measure.

2.3 Market Transformation Program Type

All of Enbridge's Market Transformation programs performed well in 2012 relative to expectations with all programs meeting or exceeding the middle range targets. These results were achieved with program spending of $5.2M – 8% more than budgeted.

Table 11. Market Transformation Targets and Results

	Component	Metric	Weight	Targets			Actual Result
				Lower	Middle	Upper	
Market Transformation	Commercial Savings by Design (New construction)	Builders/Developers Enrolled	20%	6	8	15	9
	Residential Savings by Design (New construction)	Top 20 Builders Enrolled	14.6%	1	2	3	3
		Top 80 Builders Enrolled	14.6%	7	9	18	9
	Drain Water Heat Recovery	# of Units Installed	43.8%	3000	4,000	5,000	5047
	Existing Residential: Home rating @ time of sale	Number of Committed Realtors[1]	7%	N/A	5,000[2]	10,000[2]	8600

1. Commitment to make provision for data field to show a home's energy rating for all homes listed by participating realtors

2.Commitment from realtors collectively responsible for more than this number of home listings/year

Overview

Market Transformation offers programs for the New Construction sectors (both Residential and Commercial) and Residential existing homes. Three new programs were added in 2012. These programs were developed to influence builders/developers to build to standards above the current code. The Home Labelling (Rating) program was developed to influence the home resale marketplace in understanding what a home rating represents and its value. The Drain Water Heat Recovery (DWHR)

program is an existing program that has been offered by EGD to the New Construction Residential builder market for the last four years.

2.3.1 New Construction

Drain Water Heat Recovery (DWHR)

Description: The Drain Water Heat Recovery (DWHR) program targets builders of new (Rate 1) Residential low-rise (town, semi, and detached) homes in the EGD franchise area. It is designed to promote and support the installation of DWHR units as an energy efficiency technology in homes. The DWHR unit is offered free of charge to builders, and participating builders are responsible for installation of the unit.

Objectives: The primary goal of the program is to transform the Residential New Construction market so that the installation of a DWHR unit becomes a standard component in the Enbridge franchise area

Highlights: The DWHR program focuses on encouraging builders to install the unit during construction of a new home. New construction presents the best opportunity for efficient installation of this technology. Installation is more difficult and costs increase once a home is completed, particularly in older housing stock built to different building codes.

Metrics: The number of units installed.

Tracking Methodology: Program results are tracked by number of units installed as reported by the builder participants and confirmed by signed acknowledgment forms. Stock that is shipped to the builders is tracked and reconciled to installed verification claims.

Program Results: The program was very successful with 5,047 units installed, exceeding the upper target of 5,000 units.

Cost-effectiveness: Cost-effectiveness per unit is not applicable to Market Transformation programs.

Comments and Lessons Learned:

- ✓ This program has demonstrated steady progress year over year. The persistent efforts of EGD's Channel Consultants in educating the builder market on the benefits and ease of installation of the technology, largely contributed to the overachievement of this year's results.

- ✓ EGD has worked closely with the manufacturers and builders, in an effort to allow the technology to be included in the new supplementary standard (SB-12 - Energy Efficiency for housing) Ontario Building Code (OBC) change. Just recently, Ontario has become the first jurisdiction in North America to include the units as an option in the energy-savings part of the province's building code, demonstrating a positive outcome in market transformation efforts.

- ✓ This program will be discontinued at the end of 2013. As part of the exit strategy Enbridge will no longer offer the units free of charge to the builder community, builders will now pay $100 for each unit (25% of the cost) in 2013.

Residential Savings by Design

Description: The Residential Savings by Design (SBD) program was designed and developed to encourage builders and developers to build / construct homes to 25% above 2012 Ontario Building Code (OBC). The SBD program includes a variety of incentives and support activities for builders of new homes, including support for Integrated Design Process (IDP) activities. This new initiative supports participating design teams and other stakeholders as they consider alternative approaches to energy and environmental performance as part of the design activity. Proponents must adhere to the IDP principles as specified by internationally recognized processes and must provide a final report that reflects that undertaking. Energy modeling is a critical (but not the only) component of that process.

The intent is to achieve higher energy performance through a combination of improved siting and design to optimize passive solar, day lighting, and natural ventilation; high efficiency lighting and HVAC systems; the

integration of lighting and HVAC controls to respond directly to occupant loads; reducing and/or optimizing internal loads; and improving the thermal characteristics of the envelope.

Enbridge support is in part directed towards encouraging new design paradigms that can offer significant energy efficiency gains versus more conventional approaches.

The builder is required to construct at least one home to these design specifications within three years of signing up in order to access the financial incentives. Once the home construction is complete, the builder receives the incentives based on the number of homes that pass the performance audit.

EGD expects that the SBD program will help builders see the value of the IDP approach, encouraging adoption on an ongoing basis.

Objectives: The goal is to increase the number of new homes in the Enbridge territory that are constructed to 25% greater energy efficiency than in the current Ontario Building Code (OBC).

Highlights: Feedback received to date indicates that this program has been well received by the builders that have participated in the program.

Metrics: There are two scorecard metrics for the program: 1) number of builders from a top 20 builders category; and, 2) number of builders from a top 80 builders category that participated in the IDP.

Tracking Methodology: This program requires a commitment to construct within a three-year time frame following the completion of the IDP. The program is measured based on builders from the top 20 and the top 80 list completing the IDP. In order to follow up on the builder commitment, the Channel Consultants maintain regular contact with builders to ensure proper submission procedures are followed for the builders to receive incentives, and to ensure builders follow through with their commitment of at least one home constructed to SBD standards.

EnerQuality has been engaged to provide testing and verification services to ensure that the buildings are constructed 25% better than the 2012 OBC.

Program Results: The Residential SBD program was launched January 2012 and was successful in attracting 3 of the top 20 and 9 of the top 80 builders to commit and complete an IDP.

Cost-effectiveness: Cost-effectiveness per unit is not applicable to Market Transformation programs.

Comments and Lessons Learned:

- ✓ The builders that have participated to-date in an IDP have realized the potential of alternate designs as a means to achieving improved energy and environmental performance in their projects.
- ✓ The Municipalities and Conservation Authorities have fully endorsed the program as it complements their sustainability targets.
- ✓ Builders have found the IDP very beneficial and would like to have the opportunity to go through the design process again as each development is unique in terms of housing and environmental impacts.
- ✓ Building asset managers with mixed portfolios, i.e. Residential and Commercial, are seeing the benefit of an IDP and applying to both IDP streams.

Commercial Savings by Design

Description: The Commercial Savings by Design (SBD) program was designed and developed to encourage developers to build / construct Part 3 buildings to 25% above 2012 Ontario Building Code (OBC). This initiative incorporates many of the same components as Residential SBD.

Objectives: The goal is to increase the number of new buildings in Enbridge territory constructed to 25% greater energy efficiency than in the current Ontario Building Code (OBC).

Highlights: This program has been well received by the builders that have participated. In 2012 the Commercial SBD program required eligible buildings to be larger than 100,000 square feet; this became a limiting factor to program participation.

Metrics: This program is measured based on the number of builders and developers enrolled in the IDP process.

Tracking Methodology: In order to receive incentives, a project needs to be completed within five years of a builder signing the commitment form. The EGD Channel Consultants maintain regular contact with builders to track project status, and when and/or if the projects will be completed to SBD standards. Charrette reports for each IDP contain information on the preliminary estimated savings for each project.

Program Results: The program was successful in attracting 9 developers to commit to and complete an IDP.

Cost-effectiveness: Cost-effectiveness per unit is not applicable to Market Transformation programs.

Comments and Lessons Learned:

- ✓ The 2012 program requirement that a project must be at least 100,000 square feet for a builder to participate resulted in the disqualification of some builders. Consequently, changes were made to the 2013 – 2014 program during the consultation process to update the budget and targets for the 2012 – 2014 Multi-year plan. The changes will allow builders to participate if they can show aggregate potential for construction of multiple, similar buildings to meet the square footage threshold.

- ✓ As with the Residential SBD program, the builders that have participated to-date in an IDP have realized the potential of alternate designs as a means to achieving improved energy and environmental performance in their projects.

- ✓ The Municipalities and Conservation Authorities have fully endorsed the program as it complements their sustainability targets.

- ✓ Asset managers with mixed portfolios, i.e. Residential and Commercial are seeing the benefit of an IDP and applying to both IDP streams.

2.3.2 Existing Residential

Home Labelling (Rating)

Description: The program is designed to educate the Residential market (realtors and homeowners) to better understand home energy rating and its value, with the goal to encourage widespread adoption of a voluntary home energy rating disclosure.

Highlights: In 2012, activities focused on securing commitments from brokerages, and creating awareness and educating realtors in understanding the value of home energy ratings. In addition, stakeholder outreach activities were performed during the year.

Objectives: To encourage wide spread adoption of voluntary energy home rating disclosure in the Residential market. To achieve this, the program aims to collaborate with brokerages willing to commit to promoting Home Labelling (Rating) and educating real estate agents about the system and its benefits. The Home Labelling (Rating) program aims to raise awareness and understanding among Residential (Rate 1) realtors and their clients. Ultimately the goal is to transform the re-sale market so that a home's energy performance rating becomes a standard condition of sale similar to home inspections.

Metrics: Commitments from realtors collectively responsible for more than 5,000 or 10,000 home listings per year at the middle and upper levels respectively.

Tracking Methodology: Tracking of commitment letters and feedback from realtors.

Program Results: The program was very successful, achieving commitments from brokers that collectively were responsible for listing 8,600 homes. This exceeds the middle target metric for this program.

Cost-effectiveness: Cost-effectiveness per unit is not applicable to Market Transformation programs.

Comments and Lessons Learned:

- ✓ The Green Energy Act contains a provision that would make home energy audits mandatory for all re-sale homes. Although this section of the Act has never been proclaimed, its inclusion has served to raise awareness of the potential for mandatory home rating labelling prior to sale. Paired with rising energy costs, these two factors have started to emerge as an increased priority for education in the real estate industry.

- ✓ One of the main goals of the program in 2012 was to obtain a real estate consultant to create and deliver an education package for real estate agents that would grant continuing education credit. Many brokerages prefer to choose their own education provider and/or course offering. In response to this, EGD will create a customized incentive package in 2013 that will allow brokerages to make this choice.

3.0 Natural Gas Savings CCM

Natural Gas savings estimates are a function of inputs such as participation numbers, free-ridership assumptions, measure life, base-case assumptions, and assumed savings that result from implemented projects and measures.

Table 12 provides a summary of lifetime natural gas savings results for all programs where the metric is Cumulative Cubic Meters (CCM)

Table 12. Total Natural Gas CCM

Program Type	Gross Annual m3	Net Annual m3	Gross CCM	Net CCM
Low Income	3,838,681	3,742,311	69,079,709	68,116,009
Residential	10,247,906	3,346,054	105,127,210	36,108,689
Industrial	36,016,092	18,071,496	610,001,530	305,915,406
Comm Prescriptive	3,429,652	2,762,371	59,809,853	47,373,803
Comm Custom	18,024,025	15,861,142	286,039,013	251,714,332
Multi-Res	13,636,481	10,886,422	281,313,056	224,823,144
New Construction (Comm)	7,339,628	5,465,957	181,676,611	134,925,548
Total	**92,532,465**	**60,135,753**	**1,593,046,983**	**1,068,976,932**

4.0 Lost Revenue Adjustment Mechanism (LRAM) Statement

The LRAM is a mechanism to adjust for margins the utility loses if its DSM program is more successful in the period after rates are set than was planned in setting the rates.

Table 13. LRAM Statement

2012 Annual Report LRAM Calculation

based on 50,244,721 FE m3 built into rates

Rate	Budget Net Partially Effective	Actual Net Partially Effective	Volume Variance	Distribution Margin	$	
Rate 1	4,061,176	1,991,951	(2,069,225)	~~5.2467~~	~~$(108,566)~~	21%
Rate 6	14,676,327	11,169,286	(3,507,041)	~~3.2848~~	~~$(115,198)~~	36%
Rate 100	0	0	0	0.0000	$ -	0%
Rate 110	1,656,894	1,482,675	(174,219)	1.5444	$ (2,691)	2%
Rate 115	1,054,387	1,848,737	794,350	0.8572	$ 6,809	-8%
Rate 135	0	109,479	109,479	1.3164	$ 1,441	-1%
Rate 145	1,868,324	260,238	(1,608,087)	1.7881	$ (28,753)	16%
Rate 170	3,898,784	523,099	(3,375,684)	0.5172	$ (17,457)	34%
Totals	**27,215,891**	**17,385,464**	**-9,830,426**		~~**$(264,415)**~~	
			Amount to be paid back to Ratepayers		**$ (40,652)**	

Rate	LRAM allocation
Rate 1	21%
Rate 6	36%
Rate 100	0%
Rate 110	2%
Rate 115	-8%
Rate 135	-1%
Rate 145	16%
Rate 170	34%
Totals	100%

5.0 DSM Incentive Deferral Account (DSMIDA) Statement

Background

The DSMIDA provides an incentive to the Company for DSM activities. The "Demand Side Management Guidelines for Natural Gas Utilities" (EB-2008-0346) issued on June 30, 2011 provides that "the purpose of the DSMIDA is to record the shareholder incentive amount earned by a natural gas utility as a result of its DSM Programs" It further specifies that "the natural gas utilities should apply annually for disposition of the balance in their DSMIDA, together with carrying charges, after the completion of the annual third party audit," and that "incentive amounts paid to the natural gas utilities should be allocated to rate classes in proportion to the amount actually spent on DSM activities on each rate class."

This account replaces the Shared Savings Mechanism Variance Account (SSMVA).

Scorecard Target and DSMI calculation

As stated in EB-2008-0346, page 32, the Guidelines called for targets for each of the three program types: Resource Acquisition, Low Income, and Market Transformation – to be included on their respective balanced scorecards. Furthermore the Board indicated that there should be three levels of achievement..."targets at 50%, 100% and 150% will be established for each metric on the scorecards. No incentives will be provided for achieving a scorecard weighted score of less than 50%. For each metric on the scorecard, results will be linearly interpolated between 50% and 100% and between 100% and 150%. Metric results below 50% will be interpolated using the 50% and 100% targets, metric results above 150% will be interpolated using the 100% and 150% targets."

"To encourage performance beyond the 100% target level, a pivot point should be introduced at the 100% level. More specifically, 40% of the incentive available should be provided for performance achieving a

scorecard weighted score of 100% level, with the remaining 60% available for performance at the 150% level."

"For example, if the maximum incentive available is $1 million, the incentive payment will be $400,000 if the weighted scorecard result is 100%, and $1 million if the weighted scorecard result is 150% or above.

As results are to be linearly interpolated, a weighted scorecard result of 75% would lead to an incentive payment of $200,000:

i.e. $400,000 * $\frac{(75\%-50\%)}{(100\%-50\%)}$ = $200,000"

"A weighted scorecard result of 125% would lead to an incentive payment of $700,000:

i.e. $400,000 + \left(\$600,000 * \frac{(125\%-100\%)}{(150\%-100\%)} \right)$ = $700,000"

The following table is taken from the 2012 - 2014 EGD Demand Side Management Plan filing (EB-2011-0295) which illustrates how the maximum incentive available is to be allocated across program types. The scorecards for each program type were developed in consultation with the intervenors and approved by the Board in the 2012 – 2014 EGD DSM Plan.

Table 14. Demand Side Management Incentive Allocation

Program Types	Program Budget	Overheads	Total Budget	% of Total	Maximum Incentive Available
Resource Acquisition	$15,125,000	$3,926,400	$19,051,400	61.64%	$6,440,865
Low Income	$6,120,650	$904,350	$7,025,000	22.73%	$2,375,000
Market Transformation	$3,920,000	$913,600	$4,833,600	15.64%	$1,634,135
Total	**$25,165,650**	**$5,744,350**	**$30,910,000**	**100%**	**$10,450,000**

Table 15. Scorecard Results for Resource Acquisition

	Component	Metric	Weight	Targets			Actual Result
				Lower	Middle	Upper	
Resource Acquisition	**Volumes**	Lifetime Cubic Metres (million m^3)	**92%**	615.3	820.4	1,025.50	**1000.86**
	Residential Deep Savings	Number of Houses[1]	**4%**	120	160	200	**209**
	Commercial-Industrial Deep Savings	Percent Over 25% Bill Savings	**4%**	40%	45%	50%	**25%**
						Max. DSMIDA	**$6,440,865**
						DSMIDA	**$5,265,185**

1. Number of houses with 25% per home savings and over 11,000 cumulative m3

Table 16. Scorecard Results for Low Income

	Component	Metric	Weight	Targets			Actual Result
				Lower	Middle	Upper	
Low Income	**Single Family (Part 9)**	Cumulative Savings (million m^3)	**50%**	12	17	21	**24.71**
	Multi-residential (Part 3)	Cumulative Savings (million m^3)	**50%**	33	45	56	**43.41**
						Max. DSMIDA	**$2,375,000**
						DSMIDA	**$2,228,489**

Table 17. Scorecard Results for Market Transformation

	Component	Metric	Weight	Targets			Actual Result
				Lower	Middle	Upper	
Market Transformation	Commercial Savings by Design (New construction)	Builders/Developers Enrolled	20%	6	8	15	9
	Residential Savings by Design (New construction)	Top 20 Builders Enrolled	14.6%	1	2	3	3
		Top 80 Builders Enrolled	14.6%	7	9	18	9
	Drain Water Heat Recovery	# of Units Installed	43.8%	3000	4,000	5,000	5047
	Existing Residential: Home rating @ time of sale	Number of Committed Realtors[1]	7%	N/A	5,000[2]	10,000[2]	8600
						Max. DSMIDA	$1,634,135
						DSMIDA	$1,323,855

1. Commitment to make provision for data field to show a home's energy rating for all homes listed by participating realtors
2. Commitment from realtors collectively responsible for more than [5,000/10,000] home listings/year

Table 18. 2012 DSMIDA Statement

Program Type	DSMIDA
Resource Acquisition	$5,265,185
Low Income	$2,228,489
Market Transformation	$1,323,855
TOTAL	$8,817,529

6.0 Demand Side Management Variance Account (DSMVA) Statement

As part of its EB-2008-0346 Demand Side Management Guidelines for Natural Gas Utilities, on page 34, the Board agreed that "if spending is less than what was built into rates, ratepayers shall be reimbursed for the full amount. If more is spent than was built into rates, the natural gas utility may be reimbursed up to a maximum of 15% of its DSM budget for the year. All additional funding beyond the annual DSM budget must be utilized on incremental program expenses only (i.e. cannot be used for additional utility overheads)."

The Demand Side Management Guidelines, on page 25 also established a base budget for the Natural Gas utilities on which to develop their DSM Plans. Specifically the Guidelines stated that: "The 2011 DSM budgets for Enbridge and Union are $28.1 million and $27.4 million, respectively. The Board has expressed the view that 2011 approved budgets should remain in effect for the 2012 to 2014 DSM plan term, subject to section 8.3. The budgets should be escalated annually using the previous year's Gross Domestic Product Implicit Price Index ("GDP-IPI") issued by Statistics Canada in the third quarter and published at the end of November."

The Guidelines also provided on page 26 Section 8.3 Budget for Low Income that in respect to the Low Income budget: "The natural gas utilities' total DSM budgets may be increased by up to 10%, provided the funds are solely used to support low-income programs. This means the total DSM budget for Enbridge may be increased by $2.81 million and by $2.74 million for Union. This funding increase will be considered incremental to the natural gas utilities' total DSM budget and is not cumulative."

As the Company's 2012 rate adjustment proceeding (EB-2011-0277) received rate making approval from the Board on December 1, 2011, which was prior to the Board's February 2, 2012 approval of the DSM Budget for 2012 with the proposed $2.81 million increase in low income spending, the base budget from the Guidelines of $28.1 million was built into rates.

EB-2011-0295 filed November 4, 2011 and approved by the Board in 2012, established the Enbridge DSM budget for 2012 at $30,910,000 which includes $2,810,000 for the 10% increase for Low Income programs.

The following table is taken from the EB-2011-0295 filing which outlines the calculation of the overall budget and the Low Income budget for 2012.

Table 19. 2012 DSM Plan Budget

Calculation of Overall Budget	
Base Budget	$28,100,000
10% Increase for LI Programs	$2,810,000
TOTAL BUDGET	$30,910,000

Calculation of Low Income Budget	
Low Income Budget @ 15% of $28.1M	$4,215,000
10% Increase	$2,810,000
TOTAL LOW INCOME BUDGET	$7,025,000

As shown in Tables 20 and 21 below, total program spending was $30,606,510, resulting in a variance of $303,490 or 1% under the OEB approved DSM budget. This total program spending was $2,506,510 more than what was built into rates.

Table 20. OEB Approved Budget versus Actual 2012 DSM Spending

Program Type	Budget	Actual	Variance	%
Resource Acquisition	**$19,051,400**	**$17,371,219**	**-$1,680,181**	**-9%**
Residential	*$2,808,000*	*$2,903,755*	*$95,755*	
Commercial	*$8,165,789*	*$7,960,641*	*-$205,148*	
Industrial	*$4,151,211*	*$2,618,877*	*-$1,532,334*	
Overheads	*$3,926,400*	*$3,887,946*	*-$38,454*	
Low Income	**$7,025,000**	**$8,022,121**	**$997,121**	**14%**
Part 9 Residential	*$3,795,900*	*$5,758,684*	*$1,962,784*	
Part 3 Multi residential	*$2,324,750*	*$1,367,944*	*-$956,806*	
Overheads	*$904,350*	*$895,493*	*-$8,857*	
Market Transformation	**$4,833,600**	**$5,213,170**	**$379,570**	**8%**
DWHR	*$1,950,000*	*$2,292,470*	*$342,470*	
Home Labeling	*$300,000*	*$328,241*	*$28,241*	
Residential SBD	*$895,000*	*$832,409*	*-$62,591*	
Commercial SBD	*$775,000*	*$855,398*	*$80,398*	
Overheads	*$913,600*	*$904,652*	*-$8,948*	
Program Cost Sub Total	**$25,165,650**	**$24,918,418**	**-$247,232**	
Overhead Sub Total	**$5,744,350**	**$5,688,092**	**-$56,258**	
TOTAL	**$30,910,000**	**$30,606,510**	**-$303,490**	**-1%**

Table 21. DSMVA 2012 Budget Built into Rates versus Actual 2012 DSM Spending

Program Type	Built into Rates	Actual	Variance
Resource Acquisition	**$19,098,632**	**$17,371,219**	**-$1,727,413**
Residential	*$2,808,000*	*$2,903,755*	*$95,755*
Commercial	*$8,165,789*	*$7,960,641*	*-$205,148*
Industrial	*$4,151,211*	*$2,618,877*	*-$1,532,334*
Overheads	*$3,973,632*	*$3,887,946*	*-$85,686*
Low Income	**$4,156,778**	**$8,022,121**	**$3,865,343**
Part 9 Residential	*$2,298,850*	*$5,758,684*	*$3,459,834*
Part 3 Multi residential	*$1,407,901*	*$1,367,944*	*-$39,957*
Overheads	*$450,027*	*$895,493*	*$445,466*
Market Transformation	**$4,844,590**	**$5,213,170**	**$368,580**
DWHR	*$1,950,000*	*$2,292,470*	*$342,470*
Home Labeling	*$300,000*	*$328,241*	*$28,241*
Residential SBD	*$895,000*	*$832,409*	*-$62,591*
Commercial SBD	*$775,000*	*$855,398*	*$80,398*
Overheads	*$924,590*	*$904,652*	*-$19,938*
Program Cost Sub Total	**$22,751,751**	**$24,918,418**	**$2,166,667**
Overhead Sub Total	**$5,348,249**	**$5,688,092**	**$339,843**
TOTAL	**$28,100,000**	**$30,606,510**	**$2,506,510**

*Final DSM Variance is the difference between the 10% increase for Low Income (not previously built into rates) less the underspend for 2012 programming. ($2,810,000 - $303,490 = $2,506,510 recoverable from the ratepayer). Low Income costs are allocated as per EB-2008-0150 Report of the Board: Low Income Energy Assistance Program, Section 5.1.1 Funding LEAP

The 2012 DSMVA of $2,506,510 (recoverable from the ratepayer) is calculated as shown above in Table 21.

7.0 DSM Rate Allocation and Impact

The Guidelines on page 26 Section 8.3 Budget for Low Income Programs states that: "The Board is of the view that the low-income DSM budget should be funded from all rate classes, to be consistent with the electricity conservation and demand management framework, as well as the LEAP Emergency Financial Assistance program." Allocation for the LEAP fund was outlined in EB-2008-0150 Report of the Board: Low Income Energy Assistance Program on page 11 Section 5.1.1 Funding LEAP.

Table 22. below illustrates the allocation to rate classes of the DSM Variance Accounts.

Table 22. Rate Allocation and Impact

Rate Class	DSMIDA*	LRAM	DSMVA	TOTAL
Rate 1	$4,287,162		$3,599,494	$7,886,656
Rate 6	$3,750,234		($835,707)	$2,914,527
Rate 9	$0		$562	$562
Rate 110	$0	($2,692)	($620,416)	($623,108)
Rate 115	$162,540	$6,809	$718,588	$887,936
Rate 125	$291,672		$21,087	$312,759
Rate 135	$98,915	$1,441	$252,440	$352,796
Rate 145	$109,126	($28,753)	($324,047)	($243,674)
Rate 170	$117,881	($17,457)	($314,206)	($213,783)
Rate 200	$0		$7,310	$7,310
Rate 300	$0		$1,406	$1,406
	$8,817,529	**($40,652)**	**$2,506,510**	**$11,283,387**

* rounded to the nearest dollar amount

Table 23. provides the estimated impact of the Clearance of the DSM Variance Accounts on a typical customer's bill in each of the rate classes affected.

Table 23. Estimated Impact of DSM Clearance on a Typical Customer

	Annual Volume for Typical Customer (m^3)*	Annual Bill for Typical Customer ($)	DSM Amount for Recovery** ($)	Estimated % of Annual Bill
Rate 1 - Heating & Water Heating	3,064	986	6	0.6%
Rate 6 - Commercial, Heating & Other Uses	22,606	6,093	16	0.3%
Rate 9 - Container Service***	220,922	60,584	170	0.3%
Rate 100 - Industrial, small size	339,188	78,126	-	0.0%
Rate 110 - Industrial, small size, 50% LF	598,568	121,571	(427)	-0.4%
Rate 110 - Industrial, avg. size, 75% LF	9,976,120	1,865,017	(7,123)	-0.4%
Rate 115 - Industrial, small size, 80% LF	4,471,609	820,735	8,996	1.1%
Rate 125 - Extra Large Firm Distribution****			4,217	
Rate 135 - Industrial, Seasonal firm	598,567	105,774	3,734	3.4%
Rate 145 - Commercial, avg. size	598,568	115,232	(893)	-0.8%
Rate 170 - Industrial, avg. size, 75% LF	9,976,120	1,643,922	(4,371)	-0.3%
Rate 200 - Wholesale Service			7,310	
Rate 300 - Firm or Interruptible Distribution****			703	

* Annual bills based on October 1, 2013 rates.

** DSM amounts for Recovery do not include interest amounts that will apply at the time of clearing.

*** Information is for the average Rate 9 Customer

**** DSM amounts for recovery for Rate 125 and Rate 300 are for average customers in each rate class

8.0 2011 Status Update – Auditor and Audit Committee Recommendations

1. **Recommendation**: Change the verification cycle to enable more intensive investigation of projects. This can be done through one or a combination of the following approaches to evaluation:

   a. Increase evaluation funding as a percentage of total program funds each year. We do not know Enbridge's current level of investment in verification and auditing. In North America typical energy efficiency program evaluation spending is 2% to 5% of program funding. California briefly was as high as 8%.

   b. Decrease the number of sites verified per cycle and increase the engineering rigor for each project verified. One way to do this and maintain 90/10 is to group multiple programs into a single population frame and verify the performance for them in aggregate. Grouping could be of multiple Enbridge programs (e.g., Commercial and Industrial Custom) or of multiple administrator programs in a jurisdiction (e.g., Union and Enbridge custom programs) or both.

   c. Increase funding per verification without increasing total annual funding by conducting the more rigorous exercise on a bi-annual basis instead of conducting a less rigorous exercise each year.

   d. Change the evaluation cycle to allow 6 to 9 months of post-retrofit evaluation. Can be done by either allowing later restatement of past savings or by applying the verification findings prospectively to the next rather than the prior year.

   Enbridge Response: EGD will refer this recommendation to the Technical Evaluation Committee (TEC).

   AC Response: The AC endorses this response.

   Status Update: The 2012 Custom Project Savings Verification Terms of Reference were enhanced with the involvement of the TEC to allow for an

increase in the amount of on-site measurements with expectation that such an increase would improve the level of rigor for savings validation. The TEC noted that this was interim initial step that might require further adjustment in future years.

2. **Recommendation**: Collect analysis files in native format rather than just hard copy to aid later evaluation. If this is impractical to require for all 1,000+ projects completed per year, establish criteria based on incentive value, project complexity, technology, and/or other factors to systematically do so for a subset of them. For example, analysis should be provided in native format for all applications that exceed $100,000 incentive value and are not based on e-tools calculated savings. Alternatively, require that applicants make such data available promptly upon request as part of the application terms.

   Enbridge Response: Parties involved in custom project analysis, whether the Enbridge customer, the customer's engineering firm, Enbridge staff, or the custom project verification contractors have developed their own analysis tools, most of which are proprietary. Recognizing this, Enbridge has, for some years, required customers and their engineering firms to provide all inputs used in their analysis with the project application so that the Enbridge staff and the verification contractor may replicate the analysis using their tools. Where custom project analysis files are readily available in native format, Enbridge will request that they be included in the project file.

   AC Response: The AC endorses this response.

   Status Update: EGD continues to request analysis data in native format to assist the audit and verification review process.

3. **Recommendation**: Add post-verification steps to the Custom Commercial and Industrial sampling protocol that instruct the engineering verification contractor to provide the project-specific results to the sample design contractor, and for the sample design contractor then to calculate the overall weighted average adjustment factor for use in the TRC calculator.

Enbridge Response: In the Final Audit Report, the auditor calculated the results for 2011 custom projects using a weighted average accounting for the differing expansion weights associated with each project in the sample of projects reviewed. Similar to the approach taken with this recommendation in the audit of the Union Gas 2011 DSM results, Enbridge will adjust results for 2011 individual custom projects as recommended by the auditor and recalculate the overall adjustment factor using the current method of a weighted average based on energy savings of the projects in the sample. This will result in revised values for TRC results, SSM and LRAM compared to the Final Audit Report.

Enbridge will refer this recommendation to use a weighted average based on differing expansion weights to the Technical Evaluation Committee (TEC) regarding its application to future custom project verification studies.

AC Response: The AC endorses this response.

Status Update: Consistent with the recommendation, the 2012 Custom Project Savings Verification (CPSV) firms were asked to provide their project specific results to the firm (IPSOS) that developed the sample design. That firm will then calculate the overall weighted average adjustment factor.

4. **Recommendation**: The engineering verification contractor should provide the project-specific results to the sample design contractor, and the latter firm should then calculate the final actual error ratio when they provide the final actual relative precision and report these values. Then, in the subsequent year's design, the prior year's actual error ratio can be considered.

   Exception: If the verification method was to materially change (see the next recommendation), then using 0.5 for the first verification based on the new method would be better than using the prior actual error ratio.

   Enbridge Response: Enbridge referred this recommendation to the Technical Evaluation Committee (TEC).

   AC Response: The AC endorses this response.

Status Update: A new Sampling Methodology was developed and utilized for the 2012 Enbridge Custom Project Savings Verification. The error ratio for 2012 will be calculated and could be used to inform the 2013 sample. (Due to timing, this recommendation was not forwarded to the TEC for review and comment, but will be directed to the Enbridge 2012 Audit Committee instead).

5. **Recommendation**: Collect more detailed final project cost information. These documents might include invoices, payment requisitions, or summary information from participants' in-house tracking or accounting systems.

   Enbridge Response: Enbridge will review procedures for collecting cost data in the context of the new DSM Guidelines and discuss the recommendation with future audit committees.

   AC Response: The AC endorses this response.

   Status Update: In the 2012 CPSV Terms of Reference, the review of cost information is required.

6. **Recommendation**: Unless Enbridge perceives more market volatility than auditors expect, it is probably not necessary to conduct bag tests continuously. Use the data obtained from prior bag tests to calculate weighted average unit savings values for Residential program showerheads. Re-test periodically but not continuously to assess market penetration.

   Enbridge Response: Enbridge no longer conducts bag tests in the Residential market as the program delivery is now self-install. Enbridge will consider conducting bag tests in the Multi-Residential market during the 2012 campaign.

   AC Response: The AC endorses this response.

   Status Update: EGD considered bag testing in 2012 but time constraints made this not possible. In 2013, for the Low Income Part 3 showerhead program, EGD is now installing in a new area. Additionally, there is the introduction of a 3rd party administrator to a portion of the Low Income Part

3 program. Given these changes, EGD has deemed it appropriate to undertake bag testing.

7. **Recommendation**: For pre-rinse spray valves, either re-analyze existing data or collect new data in the next round of evaluation to test whether retention rates vary by facility type (full service, limited duty, and other) and use different values if the difference is material.

   Enbridge Response: Decision was made to discontinue the Pre-Rinse Spray Valve campaign.

   AC Response: The AC endorses this response.

   Status Update: Enbridge has discontinued the Pre-Rinse Spray Valve campaign.

8. **Recommendation**: Implement consistency in the values reported in the residential verification reports. Providing the verification firms with the spreadsheets and guidance required to report adjustment factors directly rather than just the inputs to the calculation will enable greater consistency in reporting the Residential verification report results.

   Enbridge Response: Enbridge will work with the verification firms to ensure that results are presented consistently and that adjustment factors can be pulled directly from the reports.

   AC Response: The AC endorses this response.

   Status Update: As of the end of 2012 the Residential TAPS program is discontinued.

9. **Recommendation**: The auditors recommend that in future audits, a sample of participant records be reviewed to verify the participant counts and tracking procedures for programs such as the DWHR market transformation programs. Such action would be prudent for any program in which participant counts are based on the number of units installed by contractors or other parties that are not directly supervised and tracked by Enbridge staff.

Enbridge Response: Enbridge will implement this recommendation with the agreement of the 2012 Audit Committee.

AC Response: The AC endorses this response.

Status Update: As part of the verification process for Market Transformation programs, tracking procedures will be examined and participant records will be reviewed to confirm program participant counts.

10. **Recommendation:** Prioritize and complete free ridership research in 2012 for completion prior to next year's verification process.

    Enbridge Response: Enbridge referred this recommendation to the Technical Evaluation Committee (TEC).

    AC Response: The AC endorses this response.

    Status Update: An RFP process has been completed. A 3rd Party consultant has been selected and engaged. The consultant is in the process of preparing a comparative jurisdictional review. The expected completion is in Q2 2013

11. **Recommendation**: Consider incorporating spillover research with the free ridership decision-making data collection for selected Enbridge programs.

    Enbridge Response: Enbridge referred this recommendation to the Technical Evaluation Committee (TEC).

    AC Response: The AC endorses this response.

    Status Update: In tandem with the RFP previously referenced concerning free ridership research review, the same 3rd party consultant has been retained to conduct a spillover research data collection. The consultant is in the process of preparing a comparative jurisdictional review. The expected completion is in Q2 2013.

12. **Recommendation**: The scope of future audits should include selective random depth tracing of Enbridge data processing from the TRC calculator inputs back to raw field data, to make it possible to discover

errors. Also, Enbridge development and updating of detailed process flow diagrams could aid both the utility and the auditor.

Enbridge Response: Enbridge will bring forward this recommendation to the 2012 AC and is currently completing process flow diagrams for all Market Transformation programs.

AC Response: The AC endorses this response.

Status Update: The Tracking Department has developed enhancements to the tracking and monitoring process to improve audit efforts at the tracking stage. In 2013, process-flow diagrams are being completed for all Market Transformation programs.

Appendix A. TAPS and ESK Program 2012 Verification Research Reports

TAPS Verification Summary

Background

Enbridge Gas Distribution sponsored and promoted an energy conservation program by the name of TAPS. For the 2012 program, the participating contractor dropped off kits of energy-saving products to customers' homes, for customers to install. The kits contained energy-saving showerheads (2), a kitchen aerator (1) and bathroom aerators (2). Research was used to measure installation and removal of the products by customers. Results of the study are discussed below and have been applied to savings calculations.

Objectives

The objectives of the TAPS research were to:

- Determine the proportion of customers who:
  - installed
  - removed

  each of the energy-efficient products noted above.

- Assess results over time.

Methodology

Telephone interviews were conducted among residential customers who received a kit of the energy-savings products from the TAPS contractor from April to November, 2012. Only customers who recalled whether they installed the showerhead(s), kitchen aerator and bathroom aerator(s) were included in the interview results.

In addition, call back interviews were conducted among customers who have not installed all the new showerheads, but intended to. This report includes results from the initial calls and the call backs.

	Wave 1*	Wave 2	Wave 3
	April-June	July-August	September-November
Sample population (households)	28,183	29,260	24,882
Total sample used	3,706	1,946	1,259
Did not recall receiving package of energy-saving products	0.8%	2.5%	3.3%
Completed interviews	233	155	154

* Originally 154 customers were interviewed in Wave 1, 2012; however, a review of the data files revealed that May had not been included in the original sampling. Therefore, an additional 79 interviews were conducted to ensure coverage of May, 2012. The maximum margin of error for each wave is +/- 6.6 percentage points at the 90% confidence level or a total margin of error of +/- 3.5 percentage points at the 90% confidence level for the full year.

Results

The chart below shows the installation results for 2012 for energy efficient showerheads, kitchen aerators and bathroom aerators. Results reflect the initial calls and call backs.

	Wave 1	Wave 2	Wave 3
	April-June	July-August	September-November
Showerheads			
Installation factor	43.6%	35.5%	43.6%
Reduction factor	56.4%	64.5%	56.4%
Kitchen Aerators			
Installation factor	33.6%	26.9%	40.0%
Reduction factor	66.4%	73.1%	60.0%
Bathroom Aerators			
Installation factor	24.2%	19.9%	23.5%
Reduction factor	75.8%	80.1%	76.5%

ESK SUMMARY

Background

Enbridge Gas Distribution sponsors and promotes an energy-conservation program by the name of TAPS. One aspect of this program is a direct response program, which began in 2010. It was repeated in 2011 and 2012. This report summarized the results for the 2012 program.

A direct mail piece was sent to approximately 83,000 Enbridge customers in September 2012, advising them that they could receive a kit of energy-saving products at no charge to them. The offer included a bonus of 20 Air Miles. Customers completed and submitted an online form on Enbridge's website. Approximately 4,666 kit requests were processed through this campaign (6%). Fulfillment was undertaken by Ecofitt and completed by November 30, 2012. The kits contained 2 energy-efficient showerheads, 1 kitchen aerator and 2 bathroom aerators.

Objectives

The objectives of the Direct Mail Verification research were to measure:

- installation rates of the products noted above and
- 'still-installed' rates (products not removed).

Methodology

Telephone interviews using Computer-Assisted Telephone Interviewing (CATI) were conducted among residential customers of Enbridge. A total of 100 telephone interviews were completed among customers who requested and received a kit of energy-saving products. Enbridge provided a list of customers.

The margin of error is shown below.

Margin of Error	
Sampled population	4,666
Total completes	100
Margin of Error (% points at 90% confidence level)	8.2

3% of households said they didn't receive ESK package

Call Disposition and Verification of Visit for Total Interviews	
Total households as per data file	4,666
Total sample used	632
Did not receive a kit of energy-saving products	2.7%

Results

Showerhead Gross and Net Installation		
Base: Total households	100	100.0%
Don't recall installing Enbridge showerhead	1	1.0%
Base:Households that recall whether Enbridge showerhead(s) was installed	99	100.0%
Gross Installation: Installed at least 1 showerhead	72	72.7%
Don't recall how many showerheads removed	2	
Base: Households that recall whether an Enbridge showerhead was installed minus DK removing showerhead	97	100.0%
No longer have an Enbridge showerhead installed (including DK)	5	5.2%
Net installed: % households with an Enbridge showerhead(s) installed	67	69.1%
Showers Taken with Showerhead Provided by Enbridge		
Base: Households in which showerhead still installed*	64	
Average		**80.70%**
**Base excludes households that don't know % showers taken (n=3)*		
Kitchen Aerator Gross and Net Installation		
Base: Total households	100	100.0%
Don't recall installing the kitchen aerator	3	3.0%
Base: Households that recall whether kitchen aerator installed	97	100.0%
Gross Installation: % installed kitchen aerator	51	52.6%
No longer have an Enbridge kitchen aerator installed	2	2.1%
Net Installed: % kitchen aerators remaining	49	50.5%
Bathroom Aerator Gross and Net Installation		
Base: Total products	200	100.0%
Don't recall installing bathroom aerators*	4	
Base: Products for households that recall whether they installed the bathroom aerator(s)	196	100.0%
Gross Installation: % bathroom aerators installed	69	35.2%
Bathroom aerators removed (no bathroom aerators remaining in household)	1	0.5%
Net Installed: % bathroom aerators remaining	68	34.7%
** Two households did not recall whether they installed the bathroom aerators from Enbridge x 2 products = 4*		

Appendix B. Commercial Custom Project Savings Verification Study (CPSV)

Background

As part of the annual evaluation and DSM audit process, EGD commissions third party firms to undertake engineering reviews of a random sample of the custom projects in the Commercial and Industrial sectors.

Purpose of the Study

EGD retained MMM Group (MMM) and Building Innovations Inc. (BII) to conduct an engineering review of the savings for the 2012 Commercial sector custom projects (including Multi-Residential and Commercial Large New Construction). The purpose of this evaluation was to provide an objective opinion of the reasonableness of the savings (natural gas, as well as induced electricity and water savings) claimed by the Commercial sector custom projects in 2012, through a review of a statistically representative sample of the projects.

Methodology

Using a sampling methodology developed for EGD and Union Gas by Navigant Consulting, attached as Appendix F. IPSOS randomly selected 27 Commercial projects to be reviewed by MMM and BII. The reviews involved site inspections with the clients, verification of installations, utility savings results, project start-up and commissioning of measure, cost and purchase timing, any changes in the building that would change the impact of savings, any unforeseen disturbances, any savings measurements undertaken by client, a review of savings calculations and methodology and, where a more appropriate calculation was identified, the results of such a calculation were provided.

Results

Table B1 summarizes the variance between the claimed and revised savings as adjustment factors.

Table B1: 2012 Commercial Custom Projects Adjustment Factors

Gas Savings Factor	1.4%
Electricity Savings Factor	10.6%
Water Savings Factor	0%

Results of the Engineering Review are shown in Table B2 with the claimed and revised savings for gas, electricity, and water as recommended by MMM and BII.

Table B2: 2012 Commercial Sector Custom Project Verification Results

2012 Commercial Engineering Review Results	**Claimed**	**Recommended Revisions**
Commercial Projects Sampled	27	16
Gross Natural Gas Savings	6,098,415 m^3	6,184,359 m^3
Gross Electricity Savings	12,956,595 kWh	14,331,449 kWh
Gross Water Savings	0 m^3	13,783 m^3

Appendix C. Industrial Custom Project Savings Verification Study (CPSV)

Background

As part of the annual evaluation and DSM audit process, EGD commissions third party firms to undertake an engineering review of a random sample of the custom projects in the Commercial and Industrial sectors.

Purpose of the Study

EGD retained Byron J. Landry & Associates Inc. (BJL) to conduct an engineering review of the savings for the 2012 Industrial Custom projects. The purpose of this evaluation was to provide an objective opinion of the reasonableness of the savings (natural gas, as well as induced electricity and water savings) claimed by the Industrial sector custom projects in 2012 through a review of a statistically representative sample of the projects.

Methodology

A sampling methodology developed for EGD and Union Gas by Navigant Consulting was used (see Appendix F). IPSOS randomly selected 17 Industrial projects to be reviewed by BJL. The reviews involved site inspections with the clients, verification of installations, utility savings results, project start-up and commissioning of measure, cost and purchase timing, any changes in plant production that would change the impact of savings, any unforeseen disturbances, any savings measurements undertaken by the client, a review of savings calculations and methodology and, where a more appropriate calculation was identified, the results of such a calculation were provided.

Results

Table C1 summarizes the variance between the claimed and revised savings as adjustment factors.

Table C1: 2012 Industrial Custom Project Adjustment Factors

Gas Savings Factor	-1.9%
Electricity Savings Factor	6.0%
Water Savings Factor	-12.0%

Results of the Engineering Review are shown In Table C2 with the claimed and revised savings for gas, electricity, and water as recommended by BJL.

Table C2: 2012 Industrial Sector Custom Project Verification Results

2012 Industrial Engineering Review Results	**Claimed**	**Recommended Revisions**
Industrial Projects Sampled	17	6
Gross Natural Gas Savings	22,794,941 m^3	22,354,709 m^3
Gross Electricity Savings	12,090,556kWh	12,859,616kWh
Gross Water Savings	106,461 m^3	94,144 m^3

Appendix D. 2012 Multi-Residential Low Income Showerhead Verification

Background

The Low Income Multi-Residential Showerhead Program is a water conservation initiative that involves the replacement of conventional showerheads in social housing Multi-Residential buildings.

To evaluate program energy savings, Enbridge commissioned a third party, Ipsos Loyalty (IPSOS) to conduct research to verify the percentage of showerheads that have been installed and not removed in social housing Multi-Residential units that participated in the program during 2012.

Objectives

The objectives of this research were to sample a representative number of Multi-Residential units that had participated in the program and to establish an estimate of showerheads that have been and remain installed. The estimate needed to be accurate to within +/-10% 9 out of 10 times.

Methodology

Statistical Approach: Due to the nature of this research, the 'two-stage random sampling' method was chosen to minimize the otherwise prohibitive cost of a simple random sampling methodology, which would require in-person visits to far more buildings, thus substantially increasing cost. Under this approach, the initial step was to group certain smaller buildings (with lower numbers of units) into single clusters, and to split larger buildings (with large numbers of units) into multiple clusters. Then, from the resulting population of clusters, 25 were randomly selected at the first stage of the two-stage random sampling process. Step-two was to generate random samples of approximately 20 installations (units/apartments) from each of the 25 clusters, for auditing. Only the units identified by Enbridge as having had the showerhead installed were included in sample selection.

The results of this audit are accurate to within +/- 4.3%, 19 times of 20. A total of 523 inspections were conducted across 25 clusters (26 buildings).

Physical Inspection Procedure: IPSOS contacted the property managers of the selected buildings, and arranged dates and times for the inspection visits. The property manager was required to provide tenants with 24hrs notice of the inspection. On the day of each inspection, the inspector met the property manager at the building, and the property manager provided the inspector with access to each of the randomly selected units. The inspector recorded whether the showerhead installed had either a 1.5 gpm marking on it (in Toronto) or a 2.0 gpm marking (in Ottawa). The inspector photographed the showerhead if the marking was not visible. Each showerhead record (or photo) was associated with a unit number, building number and address. Upon completion of inspections, the data (including the photographs) were sent to Enbridge for verification.

Results

A total of 523 units were inspected across 25 of the 104 buildings. Inspections were conducted from March 5th to March 27th, 2012.

447 of the 523 units had showerheads with the appropriate showerhead. After adjusting the results to ensure that they are proportionate to the size of the buildings in the sample, the percentage of showerheads that are still installed is 87.7%.

Inferring these results onto the total population of 12,154 units across all 104 buildings, using a confidence level of 95%, the true proportion of low-flow showerheads is between 83.4% and 92.0%.

Review:

- Weighted percentage of low-flow showerheads in the sample = 87.7%
- Statistical inference = 87.7% +/- 4.3%, accurate 19 out of 20 times.

The results for the 2012 audit are not significantly different from those found for both the:

- 2010 audit, where 85% of low-flow showerheads were still in place.
- 2011 audit, where 84.5% of low-flow showerheads were still in place.

Appendix E. Program Assumptions

On December 19, 2012, Enbridge Gas Distribution Inc.'s" ("Enbridge) and Union Gas Ltd.'s ("Union") joint application (the "Application") sought approval for new and updated demand side management ("DSM") measures from the Ontario Energy Board (the "Board"). The Board assigned this matter file number EB-2012-0441.

On January 31, 2013, the Board accepted the new and updated measures list as reasonable.

Here is the link to the Board's web page to access the list of assumptions:

http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/search/rec&sm_udf10=eb-2012-0441&sortd1=rs_dateregistered&rows=200

Appendix F. A Sampling Methodology for Custom C&I Programs by Navigant Consulting, Inc.

NAVIGANT

A Sampling Methodology for Custom C&I Programs

Prepared for:
Sub-Committee of the
Technical Evaluation Committee

November 12, 2012

Prepared by:
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Table of Contents

1. Introduction

This report presents a sampling methodology intended for use in the evaluation of custom demand side management (DSM) programs delivered in commercial and industrial (C&I) sectors. The report provides a technical explanation of issues that have been raised in the evaluation processes. It also provides justification for the approaches recommended herein.

Past evaluation studies of Union Gas Limited (Union) and Enbridge Gas Distribution (Enbridge) custom programs have undergone third-party audits where the sample design and realization rate calculations are examined. The processes and judgments applied in these evaluation studies are audited to ensure that the analyses are transparent and accurate. The recommendations in this report along with the technical discussions are intended to better frame the issues for the third-party audit reviews and streamline the overall audit process.

The sample design methodology recommendations are presented in Section 5. The realization rate and achieved precision methodology recommendations are presented in Section 6. The report also contains three technical appendices discussing key issues and presenting the calculations required to develop statistical program estimates.

1.1 Background

Union and Enbridge have delivered DSM initiatives since 1997 and 1995, respectively. Union and Enbridge operate DSM programs, including programs that involve custom projects in the industrial, commercial, multi-residential, and new construction sectors. Custom projects cover opportunities where savings are linked to unique building and manufacturing specifications, end uses, and technologies. Each project is assessed individually for participation in the program. The DSM portfolio for both utilities includes several hundred custom projects annually.

Union and Enbridge DSM activities are regulated by the Ontario Energy Board (OEB) and adhere to the requirements as laid out in DSM Guidelines for Natural Gas Utilities.[1] For custom projects, the resource savings are determined through engineering calculations that are determined at the design stage of each project. There is a need to verify the resource savings through a third-party C&I engineering review.

A sampling methodology for custom projects was developed in 2008.[2,3] This methodology was intended to be used to evaluate future custom program impacts while the programs retained

[1] "Demand Side Management Guidelines for Natural Gas Utilities." EB-2008-0346. Ontario Energy Board. June 30, 2011.

[2] "Sampling Methodology for Engineering Review of Custom Projects." Enbridge Gas Distribution Inc. and Union Gas Limited. Prepared by Summit Blue Consulting. April 3, 2008.

roughly the same distribution of projects in terms of size and segment. There have been some changes to the custom programs and Union and Enbridge are now preparing for the engineering review of custom projects for 2012. As a result, there is a need to update the sampling methodology. Both utilities seek a harmonized approach to evaluating custom programs that involves on-site reviews of selected custom projects within a representative sample of the respective utility project populations.

In 2012, both utilities entered into a new regulatory framework in Ontario that established a new intervener process with the creation of a common Technical Evaluation Committee (TEC) for both utilities. The goal of the TEC is to establish DSM technical and evaluation standards for natural gas utilities in Ontario. The TEC will make recommendations to the OEB on annual Technical Reference Manual (TRM) updates, establish evaluation priorities, and reach consensus on the design and implementation of evaluation studies.

1.2 OEB Requirements for Evaluating Custom Projects

The OEB's DSM Guidelines for Natural Gas Utilities draws special attention to custom projects. The Guidelines define custom projects:[4]

> *Custom projects are those projects that involve customized design and engineering, and where a natural gas utility facilitates the implementation of specialized equipment or technology not identified in the Board approved list of input assumptions. Projects that simply include a combination of several measures provided in the list of input assumptions are not considered to be custom projects.* (p.5)

The Guidelines go on to prescribe an evaluation approach for custom projects:

> *For custom resource acquisition projects, which usually involve specialized equipment, savings estimates should be assessed on a case by case basis. It is expected that each custom project will incorporate a professional engineering assessment of the savings. This assessment would serve as the primary documentation for the savings claimed.*
>
> *A special assessment program should be implemented for custom projects. The assessment should be conducted on a random sample consisting of 10% of the large custom projects; and the projects should represent at least 10% of the total volume savings of all custom projects. The minimum number of projects to be assessed should be 5. Where less than 5 custom projects have been undertaken, all projects should be assessed. The assessment should focus on verifying the equipment installation, estimated savings and equipment costs.*

[3] "Update Memorandum: Proposed Sampling Method for Custom Projects." Summit Blue Consulting. October 31, 2008.

[4] "Demand Side Management Guidelines for Natural Gas Utilities." EB-2008-0346.Ontario Energy Board. June 30, 2011.

> *All program result evaluations should be conducted by the natural gas utilities' third-party evaluator(s). If possible, the natural gas utilities' third-party evaluator(s) should be selected from the [Ontario Power Authority's] OPA's third-party vendor of record list. The natural gas utilities' third-party evaluators should seek to follow the OPA's evaluation, measurement and verification protocols,[5] where applicable and relevant to the natural gas sector.* (p.39)

The recommended sample methodology contained in Sections 5 and 6 of this report conforms to the Guidelines for custom projects. Appendix B presents the detailed equations necessary to implement the recommended methodology.

1.3 Report Objective

The objective of this report is to develop a methodology for designing a sample and for calculating achieved realization rates and sample confidence and precision using the observed results from the sample. The recommended methodology must meet OEB requirements as well as address the technical and programmatic needs of Union and Enbridge custom programs. The steps taken to achieve this objective include the following:

- Understand the composition of Union and Enbridge custom programs (Sections 2 and 3)
- Review and analyze sample methodologies in selected jurisdictions (Section 4)
- Recommend a methodology for designing and selecting samples (Section 5)
- Recommend a methodology for calculating the achieved program realization rates and sample confidence and precision (Section 6)

The recommended statistical methodology can be described as two-stage stratified ratio estimation. A step-by-step approach to implementing the methodology for sample design is presented in Section 5.4.

The recommended sample methodology is intended to provide sufficient flexibility to allow Union and Enbridge to efficiently meet sample precision needs while the composition, participation, and impacts of their custom programs resemble the current 2011/2012 programs. If the nature of the custom programs changes, adjustments to the recommended methodology may be warranted.

[5] "EM&V Protocols and Requirements: 2011-2014." Ontario Power Authority. March 2011. (see page 129)

2. Overview of Union Custom Programs

Union's T1/R100 and commercial/industrial (C/I) custom programs are aligned under one brand platform, the *EnerSmart* program. This ensures a seamless, recognizable brand throughout Union's franchise. The program scorecards are divided based on rate class.[6] The T1/R100 program consists of T1 rate customers in Union's Southern delivery zone whose annual consumption is over 5M m^3 and R100 rate customers in Union's other delivery zones whose annual consumption is over 25.6M m^3. The C/I program consists of Union customers in all other rate classes. The methodology in this report pertains only to the custom measures in these programs. Additionally, Union is adding a new Low Income custom segment for the 2012 program year.[7]

Figure 1 outlines the rate class divisions of Union's custom projects. The number of projects in the C/I program is more than twice the number of the projects in the T1/R100 program but represents less than half of the savings of that program.

Figure 1. Union 2011 Custom Projects Overview

Union Custom Sector	# of Custom Projects	Gas Savings	% of Custom Portfolio
T1/R100	200	98,702,955	68.3%
Commercial/Industrial	459	45,472,108	31.5%
Low Income*	13	348,525	0.2%
Total	**672**	**144,523,588**	**100%**

*Low Income values are forecast for 2012 as this is a new segment for Union in 2012.
Source: Union Gas Limited

Custom projects are highly heterogeneous, with most projects tied directly to unique processes or technology requirements. Each project is validated on a stand-alone basis by a comprehensive professional engineering review and the overall programs are required to pass a Total Resource Cost (TRC) screening process. The EnerSmart program was designed to achieve savings in process-specific energy applications, as well as space heating, water heating, and the building envelope. Given the customized nature by which tracking database savings estimates are generated, Union conducts a third-party, on-site engineering study to verify the results of a representative project sample.

Account managers market the program directly to customers for T1/R100 and a combination of directly and indirectly through trade allies, channel partners, energy service companies, engineering firms, and equipment manufacturers to all other rate classes. Account managers work to cost-effectively promote energy efficiency within Union's C&I customer base.

[6] Historically, the Union custom C&I program was divided based on whether the customer purchased gas under a firm distribution contract or through a general service contract.
[7] Low income includes commercial and industrial general service customers.

3. Overview of Enbridge Custom Programs

Enbridge offers custom programs for the C&I sectors. A variety of incentive-based initiatives are offered to C&I sector customers. These initiatives include custom project incentives and a suite of prescriptive offerings aimed at promoting specific measures. Given the myriad of building types, end uses, ownership structures, and leasing arrangements, the C&I sector is a complex and variable segment in which to market and deliver energy efficiency.

Enbridge's Continuous Energy Improvement (CEI) initiative is focused on custom measures in the industrial segment. As part of ongoing modifications to this program, the industrial program will pursue greater targeting of small to mid-size operations and more flexibility in the incentives offered. As such, in 2012 Enbridge proposes to increase its custom incentive and expand its prescriptive offering to include more measures. Greater segment-focused marketing activities aimed at the mid-size facilities will augment the traditional marketing efforts for larger customers.

Figure 2 presents the commercial and industrial sector divisions of Enbridge custom projects in 2011. The number of projects in the commercial sector is more than six times the number of the projects in the industrial sector, but the average commercial sector project is only about one third the size of the average industrial sector project.

Figure 2. Enbridge 2011 Custom Projects Overview

Enbridge Custom Sector	# of Custom Projects	Gas Savings	% of Custom Portfolio
Commercial	780	37,470,116	68.2%
Industrial	127	17,482,847	31.8%
Total	**907**	**54,952,963**	**100%**

Source: Enbridge Gas Distribution Company

There are important differences in the Union and Enbridge custom programs. One difference is the average size of project. The average Enbridge commercial project is about 48K therms compared to about 99K therms for the Union C/I market projects. The average Enbridge industrial project is about 138K therms compared to the Union T1/R100 industrial projects, which average about 493K therms. In general terms, Enbridge's programs serve a market more dominated by commercial customers with smaller average project sizes, while Union's programs generally serve a market with more industrial customers, which results in larger projects in terms of savings. These factors need to be taken into account in an efficient sample design.

4. Analysis of Sampling Methodologies in Selected Jurisdictions

This section presents the findings from a review of sampling methodologies used in the evaluation of custom project programs in North America, including those described in annual evaluation reports of selected utilities as well as methodologies contained within evaluation protocols. The reviewed methodologies are all contained within publicly available documents. Because the reviewed documents contain varying degrees of detail and explanation, the Navigant Consulting, Inc. (Navigant) team applied its best interpretation of these documents to synthesize the available information in a consistent manner.

4.1 Summary of Jurisdictions Reviewed

The analysis of the reviewed methodologies accounts for factors such as fuel type, customer segment, and program design factors that might influence the design of samples for realization rate analyses.

Seventeen documents[8] were reviewed covering 12 unique jurisdictions in North America listed below:

- Illinois (Chicago) – Commonwealth Edison Company[9]
- Michigan (Detroit) – DTE Energy[10]
- Massachusetts – Massachusetts Energy Efficiency Advisory Council[11] covering NSTAR, National Grid, and Western Massachusetts Electric Company
- New Mexico – El Paso Electric Company,[12] New Mexico Gas Company,[13] and Public Service Company of New Mexico[14]
- Pennsylvania (Philadelphia) – PECO Energy Company[15,16]
- Ohio – AEP Ohio[17]

[8] Not counting the review of methodologies used by Union and Enbridge in prior evaluation cycles.

[9] "Evaluation Report: Smart Ideas for Your Business Custom Program." (Program Cycle 2010-2011.) Commonwealth Edison Company. Prepared by Navigant Consulting, Incorporated. May 16, 2012.

[10] "Reconciliation Report for DTE Energy's 2010 Energy Optimization Programs." DTE Energy Company. Prepared by Opinion Dynamics Corporation. April 15, 2011.

[11] "Impact Evaluation of 2008 and 2009 Custom CDA Installations." Massachusetts Energy Efficiency Advisory Council. Prepared by KEMA and SBW Consulting Incorporated. June 7, 2011.

[12] "Evaluation of 2011 DSM Portfolio." El Paso Electric Company. Prepared by ADM Associates Incorporated. May 2012.

[13] "Evaluation of 2011 DSM Portfolio." New Mexico Gas Company. Prepared by ADM Associates Incorporated. June 2012.

[14] "Evaluation of 2011 DSM & Demand Response Portfolio. "Public Service Company of New Mexico. Prepared by ADM Associates Incorporated. March 2012.

[15] "Annual Report to the Pennsylvania Public Utility Commission for the Period June 2010 through May 2011." PECO Energy Company. Prepared by Navigant Consulting. November 15, 2011.

[16] "Audit Plan and Evaluation Framework for Pennsylvania Act 129 Energy Efficiency and Conservation Programs. "Pennsylvania Public Utility Commission. Prepared by the PA Statewide Evaluation Team. November 4, 2011.

[17] "Program Year 2011 Evaluation Report: Business Custom Program." AEP Ohio. Prepared by Navigant Consulting, Incorporated. May 10, 2012.

- Maryland – EmPOWER Maryland[18] covering Baltimore Gas & Electric, Potomac Electric Power Company, Delmarva Power, Southern Maryland Electric Cooperative, and Potomac Edison
- California – California Public Utilities Commission,[19,20,21] covering Pacific Gas & Electric, Southern California Edison, Southern California Gas, and San Diego Gas & Electric
- Vermont – Vermont Department of Public Service[22] covering Efficiency Vermont and Burlington Electric Department
- PJM Interconnection – covering participating utilities in the Midwest and Eastern U.S.[23]
- U.S. Federally Owned Facilities – U.S. Department of Energy[24]
- International Performance Measurement and Verification Protocol (IPMVP) – Efficiency Evaluation Organization[25]

Figure 3 provides a high-level summary comparing the reviewed studies and Appendix C presents more detail on methods used in selected jurisdictions.

4.2 Key Findings – Review of Methods Used in Selected Jurisdictions

Commercial and industrial programs across North America range in type and size, and they frequently use inconsistent nomenclature. It is common to see custom C&I programs separated from prescriptive programs; however, some utilities do combine custom and prescriptive measures into a single program. Stratification approaches and confidence and precision targets are determined differently, depending on each utility's regulatory requirements and program organization.

Many publicly available evaluation reports tend not to describe sampling methodologies in much detail. These reports focus more on reporting evaluation results rather than describing methods used. Certain attributes of the sampling methodologies can be deduced from the reports, but explicit detail on the sampling approach ranges from little to none. The Navigant team applied its best interpretation in assessing utility evaluation reports.

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[18] "EmPower Maryland 2011 Evaluation Report – Chapter 4: Commercial and Industrial Custom and Re-commissioning Programs." Baltimore Gas & Electric, Potomac Electric Power Company, Delmarva Power, Southern Maryland Electric Cooperative, and Potomac Edison. Prepared by Navigant Consulting, Incorporated.

[19] "Energy Efficiency Evaluation Report for the 2009 Bridge Funding Period." California Public Utilities Commission. January 2011.

[20] "The California Evaluation Framework." California Public Utilities Commission. Prepared by TecMarket Works. June 2004.

[21] "California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals." California Public Utilities Commission. Prepared by TecMarket Works. April 2006.

[22] "Verification of Efficiency Vermont's Energy Efficiency Portfolio for the ISO-NE Forward Capacity Market." Vermont Department of Public Service. Prepared by West Hill Energy and Computing Incorporated. July 29, 2010.

[23] "PJM Manual 18B: Energy Efficiency Measurement & Verification." PJM Forward Market Operations. March 1, 2010.

[24] "M&V Guidelines: Measurement and Verification for Federal Energy Projects Version 3." U.S. Department of Energy. Prepared by Nexant Incorporated. April 2008.

[25] "International Performance Measurement and Verification Protocol: Concepts for Determining Energy and Water Savings Volume 1." Efficiency Valuation Organization. January 2012.

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Figure 3. Summary Comparison of Sample Methodologies in Selected Jurisdictions

N°	Service Territory or Jurisdiction	Organizations Reviewed	Year	Service Type	Timing	Precison Target	Stratify by Size	Stratify by Segment	Ratio Estimation
1	Illinois (Chicago)	Commonwealth Edison Company	2011	Electric	2-stage	90/08 (3yr utility program)	✓		✓
2	Michigan (Detroit)	DTE Energy	2010	Gas & Electric	1-stage	90/10 (utility program)		✓	✓
3	Massachusetts	Massachusetts Energy Efficiency Advisory Council (NSTAR, National Grid, Western Massachusetts Electric Company)	2009	Gas & Electric	1-stage	90/10 (statewide custom C&I)			✓
4	New Mexico	El Paso Electric Company, New Mexico Gas Company, Public Service Company of New Mexico	2011	Gas & Electric	1-stage	90/10 (utility total portfolio)	✓		✓
5	Pennsylvania (Philadelphia)	PECO Energy Company	2011	Gas & Electric	3-stage	85/15 (utility C&I total)	✓	✓	✓
6	Ohio	AEP Ohio	2011	Electric	2-stage	90/10 (utility program, RTO zone)	✓	✓	✓
7	Maryland	EmPower Maryland (Baltimore Gas & Electric, Potomac Electric Power Company, Delmarva Power, Southern Maryland Electric Cooperative, and Potomac Edison)	2011	Gas & Electric	1-stage	80/20 one-sided (utility program)	✓		✓
8	California	California Public Utilities Commission (Pacific Gas & Electric Company, San Diego Gas & Electric, Southern California Edison, Southern California Gas Company)	2009	Gas & Electric	flexible	90/10 (utility program)	✓	✓	✓
9	Vermont	Vermont Department of Public Service (Efficiency Vermont and Burlington Electric Department)	2010	Electric	2-stage	80/10 (utility portfolio)	✓	✓	✓
10	PJM Interconnection (Midwest & Eastern US)	PJM Interconnection	2010	Electric	flexible	90/10 one-sided (utility program, RTO zone)	✓	✓	✓
11	US Federal Facilities	US Department of Energy	2008	not applicable	flexible	not applicable		✓	
12	General International	Efficiency Valuation Organization (IPMVP)	2012	not applicable	flexible	not applicable		✓	

Source: Navigant review of previously cited documents in selected jurisdictions

Protocols for evaluating DSM projects in specific jurisdictions tend to provide a more detailed description of sampling methodologies used than the program evaluation reports. Protocols generally allow specific sampling options such as selecting between census, simple random sampling, and stratified sampling, as well as options for determining the appropriate basis for stratification. The reviewed protocols usually offer step-by-step processes for designing samples.

Meeting Precision Targets

Confidence and precision requirements vary widely across the reviewed methodologies. Both one-sided and two-sided confidence intervals are common. Confidence requirements range from 80% to 90%, and precision requirements ranged from 8% to 20%. These confidence and precision requirements frequently differ in the level at which they are applied, which could be for the program, the customer segment, the portfolio, or the transmission zone. One methodology[26] adheres to a relatively rigorous precision target of 90/08, but the target only applies to a 3-year term rather than annually.

On-site verification and evaluation is common industry practice for evaluating larger custom program impacts. There are cases where phone and engineering algorithm verifications have been used for custom programs in some years with more in-depth evaluation work performed in other years. Phone surveys are generally reserved for process evaluation and establishing free-ridership estimates. Phone surveys are less commonly used to estimate gross program impacts. The reviewed methodologies tend to contain a rather substantial description of the evaluation techniques used to estimate project savings, often describing in detail the engineering models applied and how parameters were measured and used. Several evaluation sample design methodologies apply more rigorous techniques or aim to achieve a census for large projects that represent a high concentration of savings in order to cost-effectively increase validity and accuracy of evaluation estimates at the project and program levels.[27,28]

Ratio estimation is used in nearly all of the reviewed methodologies and has now become a standard practice in the industry. Ratio estimation is a statistical technique whereby prior information from a tracking database—"tracked savings"—is employed to reduce the overall sample requirements. If stratification is used, the resulting precision is applied to the total based on applying the realization rate measured for each stratum.

An expected variance must be assumed to create an initial sample design. This assumption is made via an error ratio or coefficient of variation (CV). The CV is defined as the standard

[26] "Evaluation Report: Smart Ideas for Your Business Custom Program." (Program Cycle 2010-2011.) Commonwealth Edison Company. Prepared by Navigant Consulting, Incorporated. May 16, 2012.

[27] As a point of interest, the more rigorous evaluation approaches for selected large projects can, on occasion, produce a higher variance across the sample. This can produce the appearance of worsening sampling precision, but it is generally viewed as producing more appropriate levels of confidence and precision for the program.

[28] "EmPower Maryland 2011 Evaluation Report – Chapter 4: Commercial and Industrial Custom and Re-commissioning Programs." Prepared by Navigant Consulting, Inc.

deviation of the sample divided by the mean. In the case of ratio estimation, the CV should be based on the variance of project-specific realization rates rather than the variance of savings. Industry practice is to conservatively rely on historic evaluation results in selecting a CV for sample design. When historic data are not available, conservative assumptions are made, typically ranging from 0.5 to 1.0 depending on the expected homogeneity of the population.[29] Ratio estimation can sometimes reduce the CV to levels around 0.3; however, these levels represent "best outcomes" and should not be viewed as conservative when designing a sampling framework.

The reviewed methodologies more commonly apply Z-values[30,31] than T-values in determining sample precision. At larger sample sizes (i.e., greater than 30) the differences are insignificant. But for smaller samples, application of the Z-value fails to account for the limited degrees of freedom in the sample and can lead to overstating the confidence and precision achieved by the sample.

Use of the finite population correction (FPC) factor is not frequently discussed. However, the FPC has a valid statistical basis and should be used when evaluating smaller populations. Two of the reviewed methodologies[32,33] do not appear to use the FPC, and instead recommend a census if the calculated sample size approached or exceeded the population size. Any sample size calculation that exceeds the population is not taking into account the basic principles of sample design. This approach is not statistically valid and can lead to excessive evaluation costs. Although this topic is not frequently discussed, it is reasonable to assume that the FPC is applied whenever size-based sampling was used since application of the FPC is necessary to take advantage of the concentrations of savings in large projects.

Use of Stratification

The reviewed methodologies applied stratification in the sample design when population sizes were not sufficiently small to achieve a census. Stratification approaches vary across the reviewed methodologies and appear to be customized to fit each utility's program structure, number of projects, sizes of projects, regulatory requirements, and stakeholder concerns.

The review yielded two common approaches for stratifying based on size. The first approach defines the large stratum based on very large projects in the population. Sometimes a census is

[29] "PJM Manual 18B: Energy Efficiency Measurement & Verification." PJM Forward Market Operations. March 1, 2010. (See page 30)

[30] "Audit Plan and Evaluation Framework for Pennsylvania Act 129 Energy Efficiency and Conservation Programs." Pennsylvania Public Utility Commission. Prepared by the PA Statewide Evaluation Team. November 4, 2011.

[31] "The California Evaluation Framework." California Public Utilities Commission. Prepared by TecMarket Works. June 2004.

[32] "The California Evaluation Framework." California Public Utilities Commission. Prepared by TecMarket Works. June 2004. (See page 337)

[33] "Audit Plan and Evaluation Framework for Pennsylvania Act 129 Energy Efficiency and Conservation Programs." Pennsylvania Public Utility Commission .Prepared by the PA Statewide Evaluation Team. November 4, 2011. (see page 75)

sought when the very large stratum contains only a few projects. The second approach divides the population into strata of roughly equal contribution to total savings.[34] In some cases, this approach seemed to follow textbook examples rather than examining the program projects to see if alternate approaches to stratification could be designed to increase precision. Simply dividing the population into three roughly equal strata may overlook more appropriate stratification designs that could yield higher precision and confidence. This approach is more applicable when project size declines smoothly from large to small projects. Some of the reviewed methodologies apply more rigorous evaluation and measurement approaches to projects in the large stratum or for strata with highly heterogeneous populations in a cost-efficient effort to improve accuracy.

Many of the reviewed methodologies stratify by segment instead of or in addition to stratifying by size. Segments used for stratification included market sector (e.g., education, multi-family, manufacturing, and other customer-type segments), geography, and project types (space heating, water heating, or industrial process). Stratification by segment can be used to increase precision for a given sample size as well as make the sample more representative of the population.

Sample Staging

Schedule requirements for reporting often necessitate a rolling sample or staged approach to sampling in order to begin evaluation efforts early enough to complete the evaluation tasks in time to report results on schedule. About half of the reviewed methodologies implement staged sampling. Most of the methodologies do not require reporting intermediate results, but rather focus only on the final population results.[35]

A two-stage approach is most common[36,37,38] where a stage one sample is drawn based on either the first two or first three quarters of the year. Single-stage sampling and three-stage sampling also occur in the reviewed methodologies. Details on the rationale underlying the calendar periods for the different stages, and the allocation of sample to the different stages, were generally not explicitly stated. In general, approaches were based on "reasonable judgment" by the evaluators.

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[34] "Program Year 2011 Evaluation Report: Business Custom Program." AEP Ohio. Prepared by Navigant Consulting, Incorporated. May 10, 2012. (See appendix J, page 33)

[35] Pennsylvania has a slight exception. Reporting quarterly results is required by Act 129. Although quarterly reporting has been interpreted as applying to unverified results, verified results are reported for the full year.

[36] "Evaluation Report: Smart Ideas for Your Business Custom Program." (Program Cycle 2010-2011.) Commonwealth Edison Company. Prepared by Navigant Consulting, Incorporated. May 16, 2012.

[37] "Program Year 2011 Evaluation Report: Business Custom Program." AEP Ohio. Prepared by Navigant Consulting, Incorporated. May 10, 2012. (See appendix J, page 33)

[38] "Verification of Efficiency Vermont's Energy Efficiency Portfolio for the ISO-NE Forward Capacity Market." Vermont Department of Public Service. Prepared by West Hill Energy and Computing Incorporated. July 29, 2010.

Gas & Electric Service

Major differences in evaluating savings between electric and gas utilities were not found. Differences in evaluation methods are more likely based on program size and number of years evaluating and reporting program savings. Most jurisdictions count both electric and gas savings for custom C&I measures regardless of whether the administrating utility supplies both fuel types.

Bias in Results

Industry best practices prescribe a demonstration of effort to control for common sources of bias. Once a population of projects exists, the goal of the sample design is to estimate the gross savings resulting from that population.[39] The principal concern about bias is that certain elements of the population may be over- or underrepresented in the sample. Stratification is a good approach for reducing this potential bias. Bias can also result from non-random sample selection. Finally, bias can be introduced into the analysis by anomalous observations in the sample that for some reason are unique and not representative of other members of the population. If anomalous observations are also "influential" observations, then corrective action may be necessary to provide accurate information from the realization rate calculation, and the accompanying calculations of precision and confidence. The California Evaluation Framework notes:[40,41]

> *[If] there is substantial bias, perhaps due to self-selection, non-response, deliberate substitution of sample projects, or measurement bias, then the methods presented here can be seriously misleading. For example it is misleading and counterproductive to report that the average savings has been estimated with a relative precision of 10% at the 90% level of confidence if there is a serious risk that the results might be in error by 25% due to bias.* (p. 327)

The reviewed methodologies contain little description of efforts made to minimize bias. Additionally, there is little discussion on the composition of the sample, treatment of outliers, sample replacements, missing data points, or other sample adjustments. These discussions could be addressed in project memos rather than expanding what is often a lengthy final evaluation report. However, this is an area where standard industry practice may not be on par with evaluation practices in other fields. It is not clear whether this deficiency is related only to reporting or if it reflects limitations on current evaluation practice.

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[39] Issues such as self-selection bias in recruiting program participation are not an issue for sample designs whose purpose is to estimate the gross savings from those that did participate in the program. Once the frame of participant projects is determined, the biases of concern are typically based on ensuring random samples, ensuring representativeness, addressing extreme values, and using appropriate calculations consistent with the sample cases to produced unbiased estimates of the population parameters.

[40] "The California Evaluation Framework." California Public Utilities Commission. Prepared by TecMarket Works. June 2004.

[41] The California Evaluation Framework contains a substantive discussion on accuracy and bias in chapter 12.

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5. Recommended Sample Design Methodology

This section describes the recommended sample design methodology for DSM programs for Union and Enbridge. Sections 5.1–5.3 describe the key attributes of the recommended methodology and offer support for their use in evaluating Union and Enbridge custom programs. Section 5.4 presents steps for appropriate sample designs and sample selection. Sections 5.5–5.6 present examples for Union and Enbridge illustrating how the sample methodology might be implemented using representative tracking data.

Ratio estimation has become standard practice for the evaluation of large C&I programs, as it leverages information available on the population of projects with the sample. The sample design approaches discussed in this section are constructed to make full use of the ability to leverage sample data in combination with information on the population from the project tracking database. This is important given the relatively high cost of rigorously evaluating custom C&I projects. Ratio estimation has become a common industry practice in evaluation since it leverages information on the population to better interpret information from the sample. Stratification has also become a common industry practice, although its application varies, and its application may not result in strata that enhance the efficiency of the sample design. The methods presented in this section are aligned with these basic concepts of leveraging information to get the most out of the analysis.

The level of specification for sampling protocols observed in jurisdictions across North America ranges widely. An overly specified methodology may lead to incompatibilities in future evaluation efforts as the composition, participation, and distribution of impacts evolve. However, an overly general methodology may lead to sample designs that do not meet Union and Enbridge's confidence and precision requirements with cost-efficient methods. The recommended sample design methodology is intended to strike a balance between flexibility and specification to allow Union and Enbridge to best meet their evaluation needs now and in future program years.

5.1 Stratification

Stratification is recommended in designing samples for evaluating custom C&I programs. Stratification is the practice of disaggregating the population into sub-groups based on some criteria. Strata should be defined such that the strata sample frames are mutually exclusive (i.e., no overlap) and exhaustive (i.e., strata sample frames combine to represent the appropriate population sample frame). There are three generally accepted reasons to use stratification:

1. Sample Efficiency: To reduce the required sample size needed to achieve confidence and precision targets on an estimate. There are two common stratification practices that can increase sample efficiency:

- Stratifying by project size may reduce the overall number of required samples by taking advantage of the concentrations of savings when relatively few projects contribute to a large fraction of total impacts. This is most commonly seen in C&I evaluations, and the majority of reviewed methodologies apply this approach.
- Stratifying based on qualitative segments (e.g., project type or customer segment) can reduce the effective variance compared to combining the segments in a single stratum when segments of a population produce different results. For example, if the project-level realization rate (RR) is expected to average 0.9 for lighting projects and 0.8 for heating, ventilating, and air conditioning (HVAC) projects, then the variance of these segments combined will usually be greater than their individual variances. Separating lighting from HVAC would then allow smaller sample sizes to meet the required precision criteria for total combined savings.

  Stratification design must reduce the effective sample variance in order to produce gains in precision. The simple rule is that projects within a sample should have a smaller variance within the strata than across strata. Lohr notes:[42,]

  > *Observations within many strata tend to be more homogeneous than observations in the population as a whole, and the reduction in variance in the individual strata often leads to a reduced variance for the population estimate.* (p. 77)

- Stratification cannot make the problem worse (i.e., decrease precision). As a result, it is strongly recommended.

2. Segment Results Required: To ensure sufficient sample sizes that can answer questions pertaining to certain segments of the total population**.** For example, if stakeholders or interveners require results specifically for HVAC-related projects in order to improve program implementation in subsequent years, then creating strata for HVAC projects and establishing a minimum precision requirement for those strata would help ensure that sufficient data are collected to understand HVAC projects.
3. Reduced Potential for Bias by Improving the Representativeness of the Sample: For many evaluators, this is the most important reason for stratification as part of sample design. Stratification helps ensure that the sample appropriately represents the population. Since simple random sampling allows for the possibility of under-sampling certain segments, stratification can help ensure that the sample drawn provides the appropriate sample size for each segment. For example, stratifying by project type can ensure that each major project category is appropriately represented in the sample by explicitly drawing samples for each project type. Other frequently used dimensions for stratification include customer segments and site geographies. Representativeness quotas are sometimes used instead of strata to ensure representativeness.

[42] Lohr, S. L., "Sampling: Design and Analysis," Second Edition, 2010.

The specific stratification approach will depend on evaluation of the population data. If the distribution of project savings for a program is relatively tight[43] and there is not an easily delineated group of large projects, then stratification by project size alone may not produce sampling efficiencies. However, if the distribution of project savings is wide or there is clear group of large projects, then stratifying by project size will likely produce sampling efficiencies.

It is important to note that when sample observations are collected based on a stratified sample design, the strata weights must be applied in the estimation of the population realization rate.

The general rule for stratification is to attempt to select strata that have smaller variance within the strata than between strata. Stratifying by segment may also be appropriate when realization rates are expected to vary by segment. Judgment should be applied to segment the population on the basis of mechanisms that lead to different realization rates, rather than simply using common predefined segments used in program administration. For example, if steam projects are expected to have a different realization rate than other project types—or even more widely varied realization rates across steam projects—then a potentially useful segmentation may be by steam projects vs. other non-steam projects. It is not necessary to segment by every major project category to achieve the desired sampling efficiency, only those where this effect is believed to be sizeable and where stratification may also help increase the representativeness of the final sample across important technology categories.

5.2 Ratio Estimation

The application of a ratio estimation approach is recommended. Ratio estimation is the statistical technique whereby the *accuracy* of "prior" tracked estimates is applied from the sample rather than directly applying the *absolute* estimates of the sample. For DSM evaluation efforts, the sample estimator is the realization rate for each stratum rather than the sampled savings for each stratum. Ratio estimation is often used to increase the precision of estimated means and totals. It is motivated by the desire to use information about a known auxiliary quantity (i.e., tracked savings) to obtain a more accurate estimator of the population total or mean (i.e., verified savings). When applying ratio estimation within a stratified population, the separate ratio estimator approach should be used where strata are defined and analyzed before combining strata.[44]

Ratio estimation would not be possible without initial savings estimates for the population. This technique relies on establishing the variance based on the errors between the savings predicted by the stratum average realization rates for each project and the actual savings measured for each project. Ratio estimation effectively develops verified savings estimates based on measuring the accuracy of the tracked savings. Therefore, it is necessary to ensure that the tracked savings in the tracking database represent the best possible estimate based on the available information.

[43] A "tight" project savings distribution is generally considered to be within a single order of magnitude. Size-based stratification should be considered when the distribution of savings spans multiple orders of magnitude.

[44] Lohr, S. L., "Sampling: Design and Analysis," Second Edition, 2010. (Section 4.5)

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5.3 *Sample Staging*

A rolling sampling approach comprised of two sample draws (a two-stage sample approach) is recommended to ensure that spring reporting requirements can be met. Reporting schedules often do not provide sufficient time to design and evaluate a sample following the completion of the project year. This type of schedule constraint frequently occurred in the jurisdiction reviewed in Section 4. Sample staging can allow evaluation efforts to begin earlier on a preliminary sub-sample of projects completed early in the program year. Thus, staging can reduce the evaluation workload required between the end of the program year and the reporting deadline.

A two-stage sample is recommended, where the first stage takes a sample draw from projects completed in the first three quarters of the program year, and the second sample draw adds in projects completed in the fourth quarter.

The sample design for the first stage should estimate or extrapolate the numbers of projects in each stratum to the values expected at the end of the year.[45,46] Sample sizes should be determined for this preliminary sample frame as an indication of the final population. While judgment is needed to determine how much of the expected overall sample is drawn in the first stage, it is unlikely that the first stage sample would fully require three-quarters of the calculated sample sizes.[47] In general, practical considerations would support a lower split of the planned sample between the first and second stages. This would allow for a sample that adequately represents the year-end projects.

Union's and Enbridge's projects tend to come online more heavily in the fourth quarter, with roughly half to three-quarters (depending on which program) of projects completing in the last quarter. This would imply that a 50-50 split between sample stages would be reasonable, given constraints related to the calendar time needed to set up and conduct the verification studies. However, if the timing allows, Union and Enbridge might consider placing more of the sample into the fourth quarter when savings from projects completed in the fourth quarter are expected to contribute more than half of program savings. This recommendation is a compromise between the time and resources needed to perform the number of site verifications, and the need to meet program reporting deadlines. It simply is not possible for the utilities to wait until information on that year's full population of projects becomes available and then draw the sample and complete the site verifications while still meeting the program reporting deadlines.

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[45] This step is important because it will reduce the effect of finite population correction that could otherwise lead to underestimating the required sample sizes.

[46] If the final quarter of the program year is known to have very large projects in disproportion to the first three quarters, the strata weighting may be adjusted to account for this information.

[47] The sample sizes may be further reduced slightly to allow for the possibility that the assumed CV is overly conservative. If upon evaluation of the first stage, the assumed CV was not overly conservative, then additional samples may be added in the second stage.

This rolling sample or two-stage approach is often used in program evaluation (see Section 4 above) to meet timely reporting deadlines.

The sample design for the second stage should consider the population of the program year in its entirety. Sample sizes should be determined for the entire population. The first stage sample is intended to fulfill about half of the overall sample. The second stage is intended to fulfill the remainder of the sample and should be selected from projects completed in the fourth quarter.[48] If analysis of the first stage sample observations indicates insufficient sample sizes, then the first stage may be reinforced in the second stage with additional projects selected at random from the full program year population. An analysis of sample data should investigate whether differences between sample stages are significant and adjustments are needed. Again, the goal is to produce good information for making decisions regarding the custom programs for both the utilities and stakeholders. Some judgment is needed in implementing this rolling two-stage sample selection approach.

5.4 Recommended Sample Design Process—Seven Steps

The sample study should be designed to estimate the impacts of the population of projects in each program year. At the time of this report, *cumulative* gas savings measured in cubic meters (m^3) is the primary impact to be studied and should serve as the basis of the sample design.[49] The recommended sample design methodology contains the following steps:

Step 1: Review project tracking database for accuracy and quality.
Prior to any stratification or sampling, large gains can be made in the resulting analysis and precision by reviewing the estimates in the tracking database and making sure that the best possible initial project-based engineering estimates are contained in the tracking database. It is also important to make sure that appropriate contact information is contained in the files to avoid having to replace drawn sample projects with supplemental projects held in reserve. One of the most cost-effective ways to enhance the precision and confidence in the evaluation results is to make the appropriate investment in the tracking database. A tracking database that is accurate will typically reduce the costs of the evaluation, yield project realization rates that are closer to one, and have a smaller variance across the project realization rates. Many utilities do a second check of the tracking database prior to the sample design and sample selection.

Identifying unique projects in the tracking database can help avoid outlier problems later in the analysis. Examples of unique projects may be those with the only instance of a certain efficient technology installed or even those with technologies whose impacts are difficult to predict.

[48] Although this approach is intended to achieve roughly equal proportions of projects for each quarter, disproportions by quarter should not be viewed as causing notable bias. Accordingly, if the first stage produces a small number of projects in excess of what is required in the second stage, these extra projects may be counted toward meeting the fourth quarter sample size requirements.

[49] This is a new basis for custom C&I evaluation studies beginning in program year 2012. The Technical Evaluation Committee may decide to change this basis in future years.

These unique projects may be treated separately from the primary population to produce more efficient samples for the vast majority of the population. Identification of unique projects can also help ensure the representativeness of the selected sample and help eliminate problems in the interpretation of the analysis such as bias in the realization rate.

Step 2: Evaluate the population and define strata.
Examine the population for ways to leverage the sample design to improve efficiencies in meeting target confidence and precision levels. This includes three activities:

- *Exclusion of extremely small projects* – Ratio estimation weights project realization rates according to project savings. Very small projects typically exert only negligible influence on estimates of the total realization rate, the total savings, and the total achieved precision. For many very small projects, a 100% difference in realized savings would produce a negligible impact on the total estimates. The cost of evaluating the impacts of these small projects exceeds the value of the information obtained from them. Additionally, including projects that contribute only small fractions of a percent to program savings in the sample frame might result in the random selection of projects that includes a disproportionate number of these very small projects, which could reduce the accuracy with which the overall realization rate is estimated for a given sample size and reduce the overall representativeness of the sample. It is therefore considered reasonable to exclude the very small projects (i.e., representing up to 5% of the total program savings as appropriate) from the sample frame. The savings of the population of very small projects may be adjusted by an appropriate realization rate[50] and added to the program savings total.
- *Identification of project size strata bounds* – Efficiencies can be gained by stratifying by project size when the distribution of project savings is wide or there is a clear group of large projects. Sorting the projects by savings size can allow easy identification of discontinuities in the project size distribution. If it is unclear whether natural project size groupings exist; visualization of the project savings in a histogram should provide a clearer indication. Typically, strata are set such that program savings within a stratum fall within an order of magnitude.[51] Set strata bounds first based on natural breaks in the distribution that result in easily delineated groupings. If natural groupings do not exist, other approaches may be used such as stratifying into strata of roughly equal total savings. The number of size-based strata typically ranges from two to four, with three most commonly applied for C&I program evaluations.

[50] If the remaining population is stratified by size, then the average small stratum realization rate should be applied. Otherwise the population total realization rate should be applied. However, the savings accounted for by these projects is so small that alternative assumptions should not affect the overall program savings estimates. Some applications simply use a realization rate of 1.0 for these very small projects.

[51] One rule of thumb is to keep the expected coefficient of variation of project savings to less than 1.0 within a stratum.

- *Identification of categorical characteristic strata bounds* – Efficiencies can be gained by defining strata along categorical qualities such that the coefficient of variation of project realization rates for each stratum is lower than the resulting CV of the aggregated group without the categorical strata. This basis for stratifying may be applicable when a certain segment of the project population is expected to have different or more variable realization rates than the rest of the population. Units that are generally more alike should be grouped together in a stratum. For commercial projects, strata could be defined by building type (e.g., schools, office building, and multi-family). Similar buildings could be expected to have a lower variance in the estimated realization rate across sites (i.e., within the stratum) than when combined with other building types. Although categorical strata bounds are frequently applied in many DSM studies, they are not mandatory and should be prudently applied.

The sample designer may be required to make trade-offs between stratification approaches. Defining the appropriate strata is often the most important part of sample design; however, it requires data analysis skills, subject matter expertise on the project types, and knowledge of program administration and participation issues.

Step 3: Estimate an appropriate variance for each stratum.
In ratio estimation, the variance considered is that of the residuals on the stratum average realization rate rather than the variance of the verified savings. Accordingly, a CV or error ratio should be based on the assumed distribution of individual realization rates for the population of projects in each stratum.

The CVs should be based on the un-weighted[52] realization rates historic sample data, when such data are available. Any changes in program composition, administration, or participation from the previous year will decrease the validity of applying prior year CVs, and the assumed CVs should be adjusted upward by 0.1-0.2 to prevent under-sampling. It is not recommended to apply a coefficient of variation less than 0.30, in order to ensure sample sizes sufficient for robust results and to allow for increasing variances that may result from evolving measurement approaches and program participation.

A two-staged sample provides an opportunity to adjust the assumed CVs in the second stage to incorporate the sample data already observed in the first stage. The observed CVs in the first stage should still be slightly adjusted upward to account for variance and size unknowns in the second stage sample.

A CV of 0.5 may be assumed when historic data are not available. This is a standard industry assumption and is generally conservative in ratio estimation if the population tracked savings in the tracking database are reasonably accurate. However, custom projects with poor tracking

[52] The realization rates are un-weighted rather than weighted because it is assumed that any correlation between the size of a project in a stratum and its realization rate is coincidental (especially in small sample sizes). So, applying the historic correlation could result in under-sampling or over-sampling in subsequent program evaluation efforts.

database estimates may produces CVs as large as 1.0. It is not uncommon to observe program CV's lowering over time as programs mature and tracking estimates improve. CVs can also increase if more rigorous and precise methods are used to evaluate project savings; however, this should not be viewed as a negative since rigorous methods create a more accurate understanding of project and program results.

Step 4: Allocate observations to each stratum.
The overall sample should be designed to achieve 10% precision at a 90% one-sided confidence level (i.e., 90/10 one-sided).[53, 54] This confidence and precision target is meant to be used for each custom program in each year. If changes are made to this target, these changes can be addressed in the sample size calculations and do not necessarily warrant changes in the recommended methodology. Appendix A and Figure 19 provide additional explanation and illustration for the 90/10 one-sided confidence interval and the other reporting confidence intervals.

Allocating the sample across strata to achieve target confidence and precision is not a simple exercise and can often require an iterative approach. Proportional sampling is one technique that is often applied, where the total sample size is calculated for the population and subsequently allocated to strata in proportion to some characteristic such as savings. Proportional sampling, however, fails to realize the efficiencies gained from stratifying and very frequently results in over-sampling. Lohr notes:[55]

> *If the variances are more or less equal across all the strata, proportional allocation is probably the best allocation for increasing precision. In cases where the variances vary greatly [across strata], optimal allocation can result in lower costs. In practice, when we are sampling units of different sizes, the larger units are likely to be pre variable than the smaller units [in absolute terms] and we would like to sample them with a higher fraction.*[56]

The California Evaluation Framework notes the skills required:

> *Stratified ratio estimation is somewhat more complex [than simple random sampling]…it probably still requires someone to have basic training and/or experience in statistics to ensure that it is understood and applied correctly.*[57]

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[53] Based on October 25, 2012 Technical Evaluation Committee decision, the sample design should be based on a 90/10 one-sided confidence interval. Reporting of achieved confidence and precision should present the precision achieved for three confidence intervals: 90% one-sided on the lower bound, 90% one-sided on the upper bound, and 90% two-sided intervals. Appendix A provides additional explanation and illustrative examples for these reporting confidence intervals.

[54] This target may be inferentially interpreted as the intent to ensure that there is a 90% likelihood that the actual savings of the program population exceeds 90% of the sample estimate of program population savings.

[55] Lohr, S. L., "Sampling: Design and Analysis," Second Edition.2010. (Section 3.4.2 discusses optimal allocation)

[56] Lohr, S. L., "Sampling: Design and Analysis," Second Edition.2010. (Section 3.4.2 discusses optimal allocation in more detail – p. 87.)

[57] "The California Evaluation Framework." California Public Utilities Commission. Prepared by TecMarket Works. June 2004, p. 316.

Given the judgment needed to develop a sample design, it is important to test the robustness of the design by simulating different scenarios. Assessing several alternative allocations of the sample across strata can usually improve sample efficiency.

Step 5: Determine criteria for assessing sample representativeness. (optional)
There are often categorical characteristics of the population that are not used in defining strata but are still desired to ensure a reasonably representative sample.[58] For example, market segment may not have been used in defining strata; however, a random sample that fails to include certain major market segments would not be viewed as a representative sample. You could establish new strata for these factors; however, it is expected that a random draw will be representative across these factors and there is a benefit for a simple stratification design.

To address this, some criteria can be defined prior to randomly selecting a sample, which can be used to assess the representativeness of the sample. Criteria should be established only for the most important characteristics, and they should only be set for high-level characteristics that, if not met, would represent an extreme sample in terms of representing the population. Failure to meet the criteria will result in discarding the full original sample and selecting an alternate full sample. Criteria can be established only for the total population or specific strata as appropriate (See example in Section 5.5). Selection of a sample that does not meet representativeness criteria should be a rare occurrence. This approach is only meant to mitigate the possibility that a randomly selected sample might result in highly inaccurate statements about the entire population. The necessity to discard the original sample should not occur in most program years.

Step 6: Select a random sample.
The sample for each stratum should be selected at random from a uniform distribution. This provides an equal opportunity for each project within a stratum to be selected.[59] This can be accomplished in Microsoft Excel using the RAND() function[60] to assign a random number between 0 and 1 to each project in a stratum. The projects should be sorted within each stratum based on the random number assigned to it, and the projects with the highest random number should be selected for the sample until the target stratum sample size is reached.

The selected sample should be analyzed and documented. If criteria are set to assess the representativeness, the selected sample should be analyzed against these criteria at this point. If

[58] These criteria are not intended to be overly restrictive in selecting a sample. Rather, they are intended to prevent the unlikely but possible case where extreme over-representation or under-representation of certain project characteristics occurs in the sample.

[59] Sampling from a savings-weighted distribution can also be valid, but it is not recommended here since size-based strata are already employed.

[60] Note that the RAND() function will continue to generate a new set of random numbers each time a cell is updated. To prevent this, the values of the RAND() function can be copied and pasted (i.e., "paste values") into a separate column.

the sample does not meet the criteria for representativeness, then the full population sample should be discarded and a new sample should be selected.

Recruiting the full selected sample is often not achievable since some program participants may not respond or refuse to participate in the sample. Even when agreement to participate in evaluation activities is required to participate in the program, full recruitment of the selected sample can often not be achieved. Therefore, a set of potential replacement projects may be provided to recruiters to fill in for non-recruited participants.

Potential replacements should be selected from the same random number list of the population from which the original sample was selected. Replacements should be selected in priority of assigned random number until full recruitment is achieved. The full population of a stratum should not be provided to recruiters, whose incentives are not usually aligned to follow the random prioritization of the sample, unless the full sample size is not expected to be achieved.

Step 7: Recruit the sample.
Recruitment of each stratum sample can begin once the sample has been selected and assessed. Recruitment typically occurs over the phone, and may or may not involve scheduling of the on-site evaluation visit. Ensuring the accuracy and completeness of contact information in the tracking database can streamline the recruitment task.

The list of potential replacements may be initially withheld from recruiters to ensure that the originally selected sample projects are pursued fully before being replaced by alternate projects. This can help reduce the possibility for non-response bias in the sample. The California Evaluation Framework notes:[61]

> *It is very important to use the backup sample correctly. The most efficient way to recruit a sample of the desired size may appear to be to contact both the primary and backup sample at once and to schedule those sites that are first to respond and agree. But this is generally not sound practice since this approach ensures that the response will be no better than 50%, assuming that the backup sample size is equal to the primary sample size. Instead, the initial recruiting effort should be limited to the primary sample. A backup should be used only if a primary sample site is impossible to contact or refuses to participate.* (p. 350)

A full effort should be made to recruit the original sample before resorting to replacements, and the same effort should be made to recruit each replacement before moving on to the next.

[61] "The California Evaluation Framework." California Public Utilities Commission. Prepared by TecMarket Works. June 2004.

5.5 *Example Implementation of Sample Design Methodology (Union)*

This section demonstrates how the sample design methodology might be implemented for an example set of Union program data. The data used for this example has been randomized and does not indicate historic program achievements that have undergone regulatory review in prior years. The data for this example is intended to be representative of a typical program year and are used in this example for illustrative purposes only. This example is for reference and does not preclude the judgment needed to understand and address the idiosyncrasies of actual program data.

This example applies the seven steps of the sample design process presented in Section 5.4 above.

Step 1 reviews the project tracking database for accuracy and quality. Of particular emphasis is a check on the processes used to produce the initial estimates for savings contained in the database and the contact information. This step is usually undertaken by the utility and is done to provide the third-party evaluator with the best information possible. As mentioned above, a more accurate tracking database will make it more likely that confidence and precision targets will be met. This example assumes that the tracking database has been reviewed.

Step 2 evaluates the population and defines strata. Figure 4 and Figure 5 show representative project distributions of savings[62] for Union's T1/R100 and C/I programs, respectively. Analyzing the distribution of project sizes indicates that size-based stratification should produce sampling efficiencies. Other categorical bases for stratification are not chosen for this example, although Union may consider isolating new technologies into a unique stratum for future evaluation efforts.

[62] Net annual savings are used for illustration here. Beginning in 2012, the TEC will require cumulative savings to serve as the basis for evaluation studies.

Figure 4. Illustrative Distribution of Savings for Union'sT1/R100 Projects

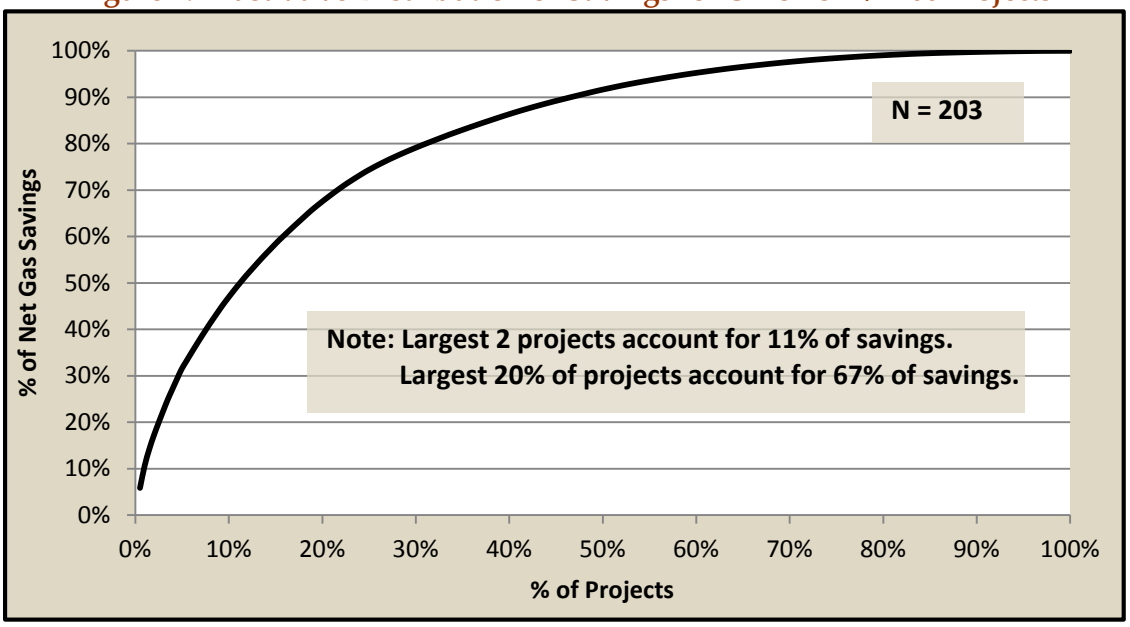
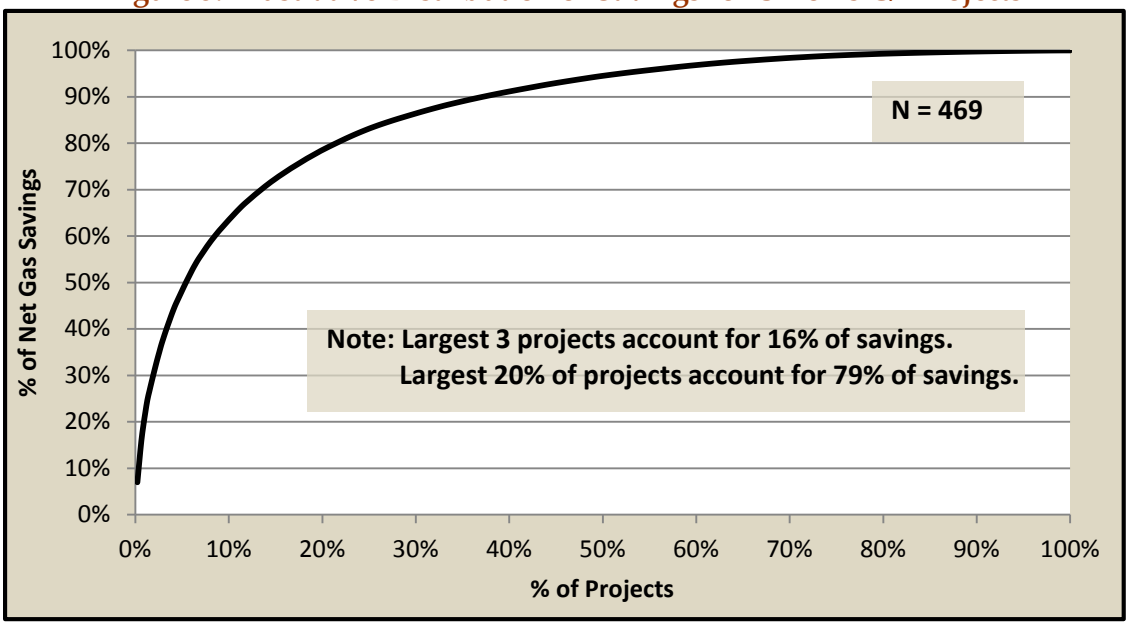


Figure 5. Illustrative Distribution of Savings for Union's C/I Projects



The sensitivity to sample sizes is investigated to determine appropriate savings thresholds for strata bounds. Figure 6 and Figure 7 show illustrative strata boundaries for Union's T1/R100 and C/I programs, respectively.

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Figure 6. Illustrative Strata Boundaries for Union's T1/R100 Projects

Stratum Size	Lower Threshold of Net Gas Savings (m^3)	Projects	Savings Represented (%)
Large	1,500,000	11	33.1%
Medium	800,000	24	29.5%
Small	100,000	97	33.9%
Very Small	0	71	3.4%

Figure 7. Illustrative Strata Boundaries for Union's C/I Projects

Stratum Size	Lower Threshold of Net Gas Savings (m^3)	Projects	Savings Represented (%)
Large	800,000	9	30.1%
Medium	200,000	44	36.1%
Small	20,000	225	30.4%
Very Small	0	191	3.3%

The "Very Small" projects—representing the bottom 3.4% of T1/R100 program savings and the bottom 3.3% of C/I program savings—are removed from the sample frame. These projects are small enough that the value of the information gained by evaluating them is not likely to be worth the cost. These projects should be adjusted by the Small Project stratum realization rate when re-introduced in the final sample analysis.

Step 3 estimates an appropriate variance for each stratum. Historical evaluation results indicate that CVs on project realization rates have been as low as 0.20 or as high as 0.40. However, typical CVs have been near 0.25. CVs are set at 0.30 for all strata in this example.

Step 4 allocates observations to each stratum. Figure 8 and Figure 9 indicate the sample sizes[63] and the assumptions used to allocate the samples when applying the calculations presented in Appendix B.

Figure 8. Illustrative Sample Allocation for Union's T1/R100 Projects

Stratum Size	Population Size	Sample Size	CV	T - value	FPC	Mean Gas Savings	Total Gas Savings	Stratum Weight
Large	11	7	0.3	1.94	0.63	2,618,182	28,800,000	0.34
Medium	24	7	0.3	1.94	0.86	1,070,000	25,680,000	0.31
Small	97	6	0.3	2.02	0.97	303,608	29,450,000	0.35
	132	20		1.73				1.00

[63] In previous program cycles when Union's custom programs were differentiated based on service contract rather than rate class, the differences between program sample sizes were much greater. Sample sizes will likely be more similar for the Union programs now that the programs differentiated based on rate class.

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Figure 9. Illustrative Sample Allocation for Union's C/I Projects

Stratum Size	Population Size	Sample Size	CV	T - value	FPC	Mean Gas Savings	Total Gas Savings	Stratum Weight
Large	9	6	0.3	2.02	0.61	1,532,222	13,790,000	0.31
Medium	44	7	0.3	1.94	0.93	375,909	16,540,000	0.37
Small	225	7	0.3	1.94	0.99	61,902	13,928,000	0.31
	278	20		1.73				1.00

The sample allocations are restricted to less than 75% of the total population for the two Large Project strata. This restriction allows for some backup projects to exist for the Large Project strata so that if recruitment of the original sample is unsuccessful, backup projects can be used and the sample will likely not require re-stratification or re-allocation.

Step 5 determines criteria for assessing sample representativeness. Note that this is listed as an optional step; however, it can be important for ensuring that the most appropriate information is provided from this analysis for making regulatory decisions such as payment of incentives and future program decisions. While the sample methodology applies techniques to minimize the required sample sizes, the smaller samples are at an increased risk that a random sample is not sufficiently representative. This is why ensuring representativeness is an import step.

This example establishes simple criteria to ensure representativeness of the sample across market segment in the R1/T100 and the C/I program sample.[64] Several market segments are specified in the tracking database, and their proportions are shown in Figure 10 and Figure 11.

Figure 10. Illustrative Representativeness Analysis of Project Market Segment for Union'sT1/R100 Program

Project Market Segment	Large Projects			Medium Projects			Small Projects		
	#	m^3	%	#	m^3	%	#	m^3	%
Agriculture	0	0	0%	0	0	0%	299	1,470,000	5%
Food Services	0	0	0%	0	0	0%	61	360,000	1%
Healthcare	0	0	0%	0	0	0%	370	910,000	3%
Manufacturing	66	28,800,000	100%	547	24,380,000	95%	6,344	24,400,000	83%
Resource	0	0	0%	0	0	0%	0	0	0%
Utility	0	0	0%	17	1,300,000	5%	1,074	2,310,000	8%
	66	28,800,000	100%	564	25,680,000	100%	8,148	29,450,000	100%

The main concern is that a randomly selected sample might under-represent the most important market segments, leading to a bias in program results. In these sample designs, less than ten sites may be drawn in a stratum; therefore, it is not impossible that this small sample size might be quite unrepresentative in some strata due to an unlucky sample draw. Increasing the sample sizes in each stratum could help resolve this issue, but the high cost of visiting each site and

[64] Union and its sampling advisor may determine that no criteria are needed or that other criteria are needed based on judgment and assessment of actual program data.

gathering the verification data makes this very expensive. As a result, this representativeness check should be considered.

In the T1/R100 program, manufacturing is clearly the dominant market segment and ensuring that a representative sample from this segment across size categories is all that may be needed; however, an evaluator may want to check to see if the random project selection (in the next step) provides some projects from non-manufacturing segments such as agriculture and utility market segments. The most significant risk is likely to occur in the small projects sample where manufacturing accounts for 77% of the projects and 83% of the savings. It could be possible to have an "extreme" sample occur in a random draw where non-manufacturing sites are "overly" represented.[65] The sample for this stratum is only six projects. If five of these projects are non-manufacturing when manufacturing accounts for 83% of the savings, this sample may not provide the information desired from this verification effort. A criteria that at least three of the projects in this stratum be manufacturing projects may represent the minimum needed to consider the sample representative overall.

Figure 11. Illustrative Representativeness Analysis of Project Market Segment for Union's C/I Program

Project Market	Large Projects			Medium Projects			Small Projects		
Segment	#	m^3	%	#	m^3	%	#	m^3	%
Agriculture	0	0	0%	519	4,090,000	25%	10,784	4,301,000	31%
Education	7	4,400,000	32%	40	250,000	2%	2,438	1,210,000	9%
Entertainment	0	0	0%	0	0	0%	349	112,000	1%
Healthcare	0	0	0%	0	0	0%	3,306	918,000	7%
Manufacturing	38	9,390,000	68%	827	12,200,000	74%	19,337	6,896,000	50%
Multi-Family	0	0	0%	0	0	0%	569	152,000	1%
Resource	0	0	0%	0	0	0%	65	160,000	1%
Retail	0	0	0%	0	0	0%	172	43,000	0%
Transport	0	0	0%	0	0	0%	93	110,000	1%
Utility	0	0	0%	0	0	0%	237	26,000	0%
	45	13,790,000	100%	1,386	16,540,000	100%	37,350	13,928,000	100%

In the C/I program, the most important market segment is clearly manufacturing, followed by agriculture and education. To ensure that this is a representative sample, it may be important to be sure that the projects selected in the next step (random selection) contain some projects from each of these market segments. Manufacturing represents 64% of the overall savings. The agriculture and education market segments account for 18% and 13%, respectively, or 31% of total savings when taken together. Given a sample size of 20 overall, and no more than 7 in each stratum, a sample might be drawn that could be extreme in terms of its accurate representation of the population. Again, the concern is the high cost of conducting the site visits, which argues against simply expanding the sample size or adding new strata. To ensure that manufacturing does not entirely dominate the sample, it might be good to set representativeness criteria, for example, that at least four sites be non-manufacturing sites.

[65] What constitutes "overly" represented simply has to be defined by judgment exercised by the evaluator.

Step 6 selects a random sample. The selection of the sample should be uniformly random within each stratum. This is accomplished by applying the RAND() function in Microsoft Excel and selecting the projects with the highest randomly assigned numbers to fulfill sample size requirements. The sample is reviewed to ensure that it meets any previously established criteria. Backup projects are also selected to replace any projects from the primary sample that are not successfully recruited.

Step 7 recruits the sample. Projects from the primary sample are only replaced after four recruitment attempts on four different dates. Projects that are not successfully recruited are documented before being replaced by backup projects.

These seven steps illustrate how the sample design methodology might be implemented using representative data. Following verification and evaluation of the sample, the sample data should be analyzed according to the realization rate methodology presented in Section 6 and according to the calculations presented in Appendix B.

5.6 Example Implementation of Sample Design Methodology (Enbridge)

This section demonstrates how the sample design methodology might be implemented for an example set of Enbridge program data. The data used for this example has been randomized and does not indicate historic program achievements that have undergone regulatory review in prior years. The data for this example is intended to be representative of a typical program year for illustrative purposes only. This example is for reference and does not preclude the judgment needed to understand and address the idiosyncrasies of actual program data.

This example applies the steps of the sample design process presented in Section 5.4.

Step 1 reviews the project tracking database for accuracy and quality. This example assumes that the tracking database has been reviewed.

Step 2 evaluates the population and defines strata. Figure 12 and Figure 13 show representative project distributions of savings[66] for Enbridge's commercial and industrial programs, respectively. Analyzing the distribution of project sizes indicates that size-based stratification should produce sampling efficiencies. Other categorical bases for stratification are not chosen for this example.

[66] Net annual savings are used for illustration here. Beginning in 2012, the TEC will require cumulative savings to serve as the basis for evaluation studies.

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Figure 12. Illustrative Distribution of Savings for Enbridge Commercial Projects

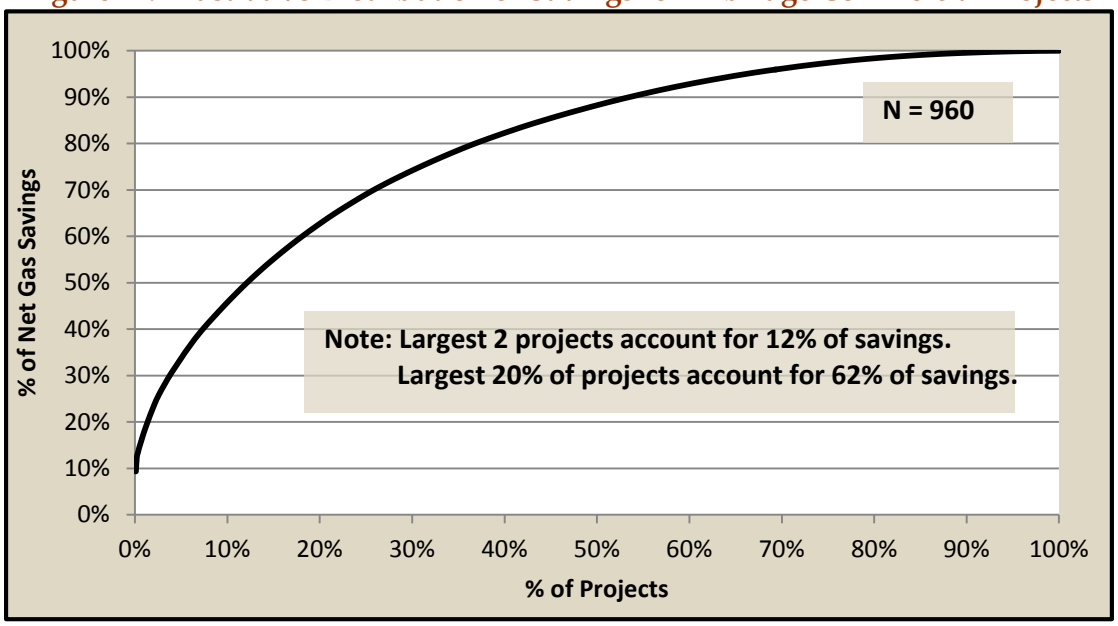
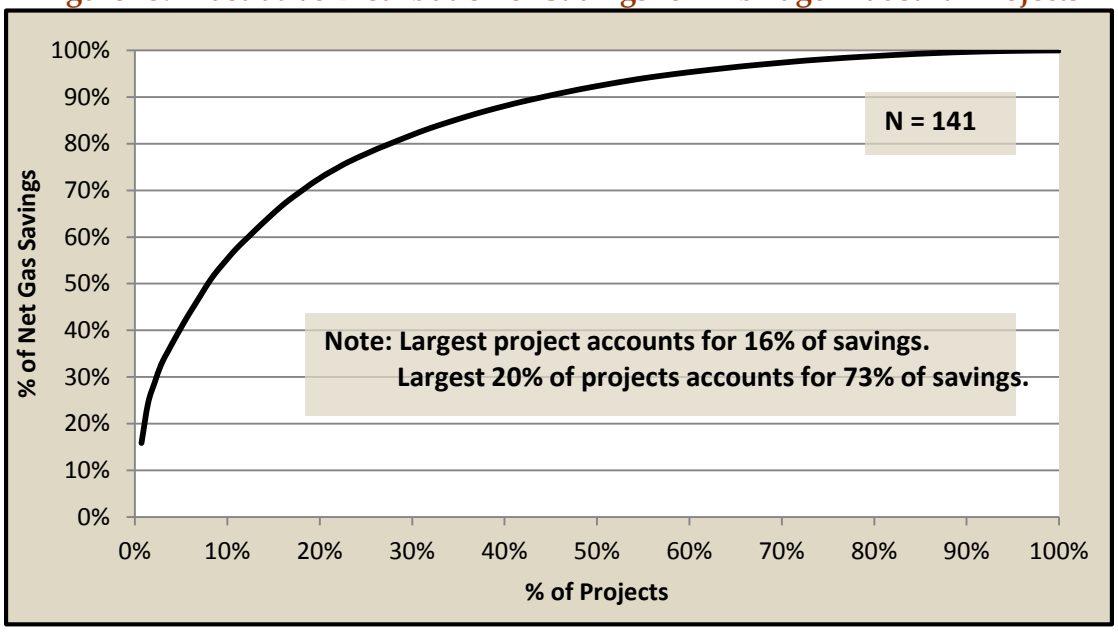


Figure 13. Illustrative Distribution of Savings for Enbridge Industrial Projects



The sensitivity to sample sizes is investigated to determine appropriate savings thresholds for strata bounds. Since the commercial program has a relatively large number of projects, it is necessary to balance the effects of strata weight with the effects of finite population correction when determining the threshold for the Large Project stratum. Figure 14 and Figure 15 show illustrative strata boundaries for Enbridge's commercial and industrial programs, respectively.

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Figure 14. Illustrative Strata Boundaries for Enbridge Commercial Projects

Stratum Size	Lower Threshold of Net Gas Savings (m^3)	Projects	Savings Represented (%)
Large	250,000	9	17.5%
Medium	70,000	125	35.8%
Small	10,000	563	43.5%
Very Small	0	263	3.2%

Figure 15. Illustrative Strata Boundaries for Enbridge Industrial Projects

Stratum Size	Lower Threshold of Net Gas Savings (m^3)	Projects	Savings Represented (%)
Large	400,000	8	42.9%
Medium	100,000	32	37.7%
Small	20,000	62	17.2%
Very Small	0	39	2.2%

The "Very Small" projects—representing the bottom 3.2% of commercial program savings and the bottom 2.2% of industrial program savings—are removed from the sample frame. These projects are small enough that the value of the information gained by evaluating them is not likely to be worth the cost. These projects should be adjusted by the Small Project stratum realization rate when re-introduced in the final sample analysis.

Step 3 estimates an appropriate variance for each stratum. Historical evaluation results indicate that CVs on project realization rates have been very low, sometimes less than 0.10. However, applying CVs less than 0.30 is not recommended in order to ensure sample sizes sufficient for robust results and to allow for increasing variances that may result from evolving measurement approaches and program participation. CVs are set at 0.30 for all strata in this example.

Step 4 allocates observations to each stratum. Figure 16 and Figure 17 indicate the sample sizes and the assumptions used to allocate the samples when applying the calculations presented in Appendix B.

Figure 16. Illustrative Sample Allocation for Enbridge's Commercial Program

Stratum Size	Population Size	Sample Size	CV	T - value	FPC	Mean Gas Savings	Total Gas Savings	Stratum Weight
Large	9	5	0.3	2.13	0.71	751,111	6,760,000	0.18
Medium	98	8	0.3	1.89	0.97	110,384	13,798,000	0.37
Small	590	11	0.3	1.81	0.99	29,766	16,758,000	0.45
	697	24		1.71				1.00

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Figure 17. Illustrative Sample Allocation for Enbridge's Industrial Program

Stratum Size	Population Size	Sample Size	CV	T - value	FPC	Mean Gas Savings	Total Gas Savings	Stratum Weight
Large	8	6	0.3	2.02	0.53	947,500	7,580,000	0.44
Medium	32	6	0.3	2.13	0.92	208,125	6,660,000	0.39
Small	62	5	0.3	2.35	0.97	48,903	3,032,000	0.18
	102	17		1.75				1.00

The key reason that the required sample size is smaller for the industrial program than the commercial program is that a larger fraction of the savings is concentrated in a smaller number of projects for the industrial program. The sample allocations are restricted to less than 75% of the total population for the two Large Project strata. This restriction allows for some backup projects to exist for the Large Project strata so that if recruitment of the original sample is unsuccessful, backup projects can be used and the sample will likely not require re-stratification or re-allocation.

Step 5 determines criteria for assessing sample representativeness. This can be important for ensuring that the most appropriate information is provided from this analysis for making regulatory decisions such as payment of incentives and future program decisions. While the sample methodology applies techniques to minimize the required sample sizes, the smaller samples are at an increased risk that a random sample is not sufficiently representative. This is why ensuring representativeness is an important step.

This example establishes a simple criterion to ensure representativeness of load type in the commercial program sample.[67] Three load types are specified in the tracking database, and their proportions are shown in Figure 18.

Figure 18. Illustrative Analysis of Project Load Types for Enbridge's Commercial Program

Project Load Type	Large Projects			Medium Projects			Small Projects		
	#	m^3	%	#	m^3	%	#	m^3	%
Space Heating	7	6,190,000	92%	111	11,853,000	86%	485	14,874,000	89%
Water Heating	1	320,000	5%	3	368,000	3%	65	1,386,000	8%
Combined	1	250,000	4%	11	1,577,000	11%	13	498,000	3%
	9	6,760,000	100%	125	13,798,000	100%	563	16,758,000	100%

The main concern is that a randomly selected sample might over-represent water heating to the detriment of properly representing space heating projects simply due to an unlucky draw of insufficiently representative projects. As example criteria, it might be reasonable to require that space heating projects must account for at least 70% of the savings in each stratum. A sample

[67] Enbridge and its sampling advisor may determine that no criteria are needed or that other criteria are needed based on judgment and assessment of actual program data.

that does not meet these criteria would be viewed as unrepresentative and would be discarded and re-selected.

Step 6 selects a random sample. The selection of the sample should be uniformly random within each stratum. This is accomplished by applying the RAND() function in Microsoft Excel and selecting the projects with the highest randomly assigned numbers to fulfill sample size requirements. The sample is reviewed to ensure that it meets any previously established criteria. Backup projects are also selected to replace any projects from the primary sample that are not successfully recruited.

Step 7 recruits the sample. Projects from the primary sample are only replaced after four recruitment attempts on four different dates. Projects that are not successfully recruited are documented before being replaced by backup projects.

These seven steps illustrate how the sample design methodology might be implemented using representative data. Following verification and evaluation of the sample, the sample data should be analyzed according to the realization rate methodology presented in Section 6 and according to the calculations presented in Appendix B.

5.7 Summary of Sample Design Methodology

The sample design methodology described in this section is meant to apply advanced industry practices to create a cost-efficient sample by leveraging preexisting project and program information to the greatest extent possible. The methodology can be described as employing a "stratified ratio-estimation" approach. The sample is administered in two stages to make the best use of early observations that can be collected prior to completion of the program year. The methodology provides a step-by-step description of sample design tasks, but leaves flexibility to accommodate program changes in future years and cycles.

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6. Recommended Realization Rate Methodology

This section describes the recommended methodology for determining realization rates and achieved confidence and precision based on sample observations of custom DSM programs for Union and Enbridge. Section 6.1 describes the approach to determine verified realization rates. Section 6.2 describes the approach to determine the precision on the realization rate and total savings achieved by the sample. Section 6.3 discusses several potential adjustments that may be needed to ensure that the results appropriately characterize the population and provide the information needed by the utilities and stakeholders.

It is important ensure the quality of sample observation data prior to calculating achieved realization rates and savings. Data quality issues can sometimes be discovered when analyzing the sample, but it can be costly to correct the data at that point. Undetected data quality issues would result in inaccuracies of total savings and precision estimates.

6.1 Determining Verified Realization Rates

Realization rates should be calculated for each stratum sample and applied to each respective stratum population when estimating total savings. Applying realization rates to population strata is more complicated than assessing the results in a simple random sample without strata, but it is necessary when efficiencies are sought through stratification.[68] Again, efficiencies are important in this application due to the high cost of gathering the verification data at each sample site. Lohr notes:

> *The population total is the [sum across all strata of the estimated stratum population mean times the stratum population size]…This is a weighted average of the sample stratum averages; the weights are the relative sizes of the strata. To use stratified sampling, the sizes or relative sizes of the strata must be known.* [69]

Also, Wadsworth notes:

> *The estimator of the total of a stratified population can be expressed as the sum of strata of estimators of the individual stratum totals. This representation suggests the valid generalization that the estimator of the total in a stratum need not be limited to the expansion estimator, but could be any appropriate estimator of the population in the stratum, including a ratio estimator…then an estimate of the total in a stratified population may be constructed as a sum over strata.* [70]

[68] There are examples in the evaluation literature where strata weights have not been used in the calculation of the mean realization weight. This is clearly an oversight in these evaluations as it is a simple matter to weight the mean ratios of each stratum by the appropriate stratum weight (i.e., the proportion of the population in that stratum).

[69] Lohr, S. L., "Sampling: Design and Analysis," Second Edition. 2010, p. 69.

[70] Wadsworth, H.M., "Handbook of Statistical Methods for Engineers and Scientists," 1990, p. 9.25.

These are standard procedures for developing population estimates from a stratified sample. The methods for estimating the population parameters must take into account the strata weights when stratification is used. The calculations needed to develop a verified realization rate from stratified sample data are shown in Appendix B. This approach is based on widely recognized methods published by Lohr.[71]

This approach for determining realization rates is consistent with the recommended sample design methodology presented in Section 5.

6.2 *Determining Achieved Confidence & Precision*

A precision level cannot be calculated without first establishing the confidence level. The calculation for both confidence and precision comes from the same basic equation. Either confidence or precision is first established, then the other is solved for. For example, a precision of +/- 10% implies that the stated confidence level should span +/- 10% from the mean estimate. The confidence may turn out to be 90%, 82% or another value. The confidence level is more typically established and the precision is solved for. For example, the level of precision achieved at a 90% level of confidence can be calculated and may turn out to be 10%, 12%, 15% or some other number (as illustrated in Appendix A). Regardless, the calculating confidence and precision are part of the same equation and one cannot be estimated without establishing the other. Misunderstanding this basic concept frequently leads to problems in presenting and discussing evaluation results in the industry. Additional discussion on confidence and precision can be found in Appendix A.

Confidence and precision calculations also have to take into account the fact that a stratified random sample has been used. The equations for calculating confidence and precision from a stratified sample design are shown in Appendix B. This approach for determining confidence and precision is consistent with the recommended sampling methodology in Section 5, and it is consistent with the population realization rate and savings estimates described in Section 6.1.

Communications with the TEC indicated that they were interested in both the likelihood that savings exceeds a given value and the likelihood that it falls above a given value. As a result, the recommendation is to report achieved confidence and precision in three ways:[72]

1. Achieved precision corresponding to 90% one-sided confidence on the lower bound
2. Achieved precision corresponding to 90% one-sided confidence on the upper bound[73]
3. Achieved precision corresponding to a 90% two-sided confidence interval

[71] Lohr, S. L., "Sampling: Design and Analysis," Second Edition.2010. (Sections 4.1-4.5)

[72] The achieved precision is a result of analyzing the sample data, and will usually differ to some extent from the targeted precision applied in designing the sample.

[73] Achieved precision of the upper bound represents a simple inversion of the confidence interval for the lower bound. Reporting on the upper bound is intended to facilitate an understanding that sampling uncertainties can just as likely lead to underestimation of the realization rate and therefore underestimating overall program savings as they are to result in overestimates.

Appendix A provides additional explanation and illustrative examples for the reporting of confidence and precision in the estimated realization rate. The Figures in Appendix A are intended to clarify the interpretation of confidence and precision in making decisions based on the estimated realization rate.

6.3 *Sample Adjustments & Related Issues*

This section discusses several sampling adjustments that may be needed to accurately synthesize the total population realization rate and savings estimates. The following three types of adjustments are discussed:

1. Treatment of outliers and influential observations
2. Replacing sample projects
3. Post-stratification

Appropriately treating outliers and influential observations is important in accurately estimating the realized savings for DSM programs. Parties to a discussion of estimating program savings should understand appropriate treatment of outliers and influential observations when estimates are based on a sample of the population.

Treatment of Outliers & Influential Observations

This section first presents a conceptual discussion. Following this discussion, an example from a recent Union custom program evaluation is presented. Most statistical analyses should examine the data for outliers and test to determine whether these outliers may be "influential observations" that can skew the accuracy of a sample. Kennedy states the rationale for treating outliers:

> *The rationale for looking for outliers is that they may have a strong influence on the estimates…an influence that may not be desired.* [74]

In other words, the reason for looking for evaluating outliers is that there may be a sample case drawn that is well outside the expected bounds of the distribution and that this observation may exert undue influence on the estimates of the analysis (i.e., an influential observation). Osborne and Overbay further describe the effect of outliers:

> *The presence of outliers can lead to inflated error rates and substantial distortions of parameter and statistic estimates when using either parametric or nonparametric tests (e.g., Zimmerman, 1994, 1995, 1998). Casual observation of the literature suggests that researchers rarely report checking for outliers of any sort.* [75]

[74] Kennedy, P. "A Guide to Econometrics." Third Edition. MIT Press, 1992, p. 279.

[75] Osborne, J., Overbay, A. "The Power of Outliers and Why Researchers Should Always Check for Them."2004 Practical Assessment, Research & Evaluation, volume 9, section 6. Link: http://pareonline.net/getvn.asp?v=9&n=6

The issue is whether it is appropriate for a single observation to swing the overall results in a substantial manner.[76] If such an observation is found, then further study is needed to determine the most appropriate course of action. In general, a sample of 10 from a population of 100 projects implies that each sample point represents 10 projects. However, if a selected sample point is truly a unique case and does not represent other projects in the population, then an adjustment may be warranted. Osborne and Overbay go on to state:

> *[The appropriate treatment] depends in large part on why an outlier is in the data in the first place. Where outliers are illegitimately included in the data, it is only common sense that those data points should be removed… Few should disagree with that statement.*

The sample analysis should seek to determine whether or not outliers and influential observations can be viewed as representative members of the main population upon which population estimates may be inferred. Barnett and Lewis note:[77]

> *If they are not [suitable]…they may frustrate attempts to draw inferences about the original (main) population.*

One example can be taken from the analysis of the sample observation in Union's 2011 custom program. Two outliers were identified in the Distribution Contract (DC) custom program. One verified project observed a gas savings realization rate of 3.75 and a second project observed a realization rate of 0.18. A sensitivity analysis tested for the influence of these two observations by removing[78] them and noting the changes in results.[79]

The estimated overall realization rate for gas savings when including both observations was 1.25. This is a relatively high realization rate when compared to evaluation efforts across North America, but not an unheard of result. Excluding the high observation lowered the estimated overall estimate from 1.25 to 1.05. Excluding the low observation raised the overall estimate from 1.25 to 1.32. Excluding both outliers produced an overall realization rate on gas savings of 1.11.

Discussions were held with Union concerning the two outlier observations. It is important not to exclude an observation without examining the reasons that may contribute to the

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[76] A simple intuitive example of the impacts an outlier can have on a statistical analysis can be found in a Wikipedia contribution (8/20/2012): *Naive interpretation of statistics derived from data sets that include outliers may be misleading. For example, if one is calculating the average temperature of 10 objects in a room, and nine of them are between 20 and 25 degrees Celsius, but an oven is at 175 °C, the median of the data could be between 20 and 25 °C but the mean temperature will be between 35.5 and 40 °C. In this case, the median better reflects the temperature of a randomly sampled object than the mean; however, naively interpreting the mean as "a typical sample", equivalent to the median, is incorrect. As illustrated in this case, outliers may be indicative of data points that belong to a different population than the rest of the sample set.*

[77] Barnett, V., Lewis, T., "Outliers in Statistical Data." Wiley Series in Probability & Statistics, 1998/1994.

[78] Removing or excluding an outlier entails isolating the sample point in a unique stratum such that the sample point still counts in the analysis, but it is not used for extrapolating results for the un-sampled population.

[79] Note that some observations may be identified as outliers but do not significantly influence the analysis results.

observation's extreme value. If the observation is representative of other projects in the population, it should be left in. If it can be shown to result from a one-time construct and is not likely to be replicated by other members of the population, then exclusion of this observation should be considered. The discussions with Union indicated that both observations were likely due to unique calculation issues and technologies involved.

The most conservative position in treating this outlier issue was taken—the high observation was removed and the low observation was retained in the sample data set. This produces the lowest overall program realization rate given the choices in addressing the identified outliers. However, removing outliers in strata with small sample sizes may also adversely affect the confidence and precision results and the sample may require augmentation to achieve confidence and precision targets.

Projects that implement new technologies—whose savings estimates have had less validation—or certain technology classes that are complex and difficult to estimate for the tracking database may be at an increased likelihood to result in outlier realization rates. Identifying such projects in the program tracking database could help isolate them and reduce their chance of skewing program estimates. These projects could be placed into a separate category with different confidence and precision targets for new technologies. Any projects that are truly unique should be identified and addressed during sample design. These steps would not eliminate these projects in terms of their contribution to overall program savings, but would allow for appropriate methods to more accurately estimate program savings. If sampled, these unique projects should not be considered representative of other projects in the main program. As a result, addressing this issue in advance could improve the sample analysis and the resulting program estimates.

Replacing Sample Projects

The final recruited sample should be analyzed and summarized, especially when replacement projects are substituted into the originally selected sample. Recruiters should document the reasons for unsuccessful recruitment of original sample members. Replacement samples should always be selected in priority based on the assigned random number, and full effort should be made to recruit selected replacements before substituting other replacements. If recruitment rates are very poor, this may introduce a significant non-response bias. Low recruitment rates should be investigated and documented, and recommendations may be made to improve recruitment in subsequent evaluation years.

Post-Stratification

If a sample did not achieve the desired confidence and precision and the stratification basis is thought to be sub-optimal, post-stratification may be used to retrospectively re-stratify a sample along more appropriate dimensions to demonstrate an improved precision achieved by the sample. Often, post-stratification will not improve achieved precision, especially at relatively small sample sizes; however, under certain circumstances this technique may be useful. The Ontario Power Authority notes that:

A technique known as post-stratification may be used to develop estimates about sub-populations after the study is complete and can be used if characteristics about the sub-populations are unknown at the time the study in conducted.

This advanced technique should be reserved for special situations and utilized only after careful consideration of other options and well documented in the experimental approach of the Draft Evaluation Plan. [80]

Post-stratification should not be used on a normal basis, and if necessary should inform subsequent program evaluation cycles to improve the sample frame and prevent the need for post-stratification in future years.

6.4 Summary of Realization Rate Methodology

This section presents the method for calculating verified ex-post realization rates as well as for appropriately calculating the confidence and precision levels for the estimated realization rate and overall program savings. It also discusses three issues that can lead to adjustments to the sample and recalculation of the realization rate along with confidence and precision levels. There are several important concepts presented in this section:

- The program realization rate is inferred from the sample observations based on the separate realization rates for each stratum.
- The realization rate calculations should apply the strata weights to accurately interpret sample observations. This adds a bit of complexity, but no alternate application of the observed data would be appropriate. This is considered standard practice in the application of a stratification approach in statistics.
- There are some important and legitimate considerations that should be examined when inferring estimates for a population from an observed sample. The following three factors are discussed in this section:
    1. Outliers and influential observations
    2. Replacement projects when data cannot be gathered from the originally sampled project
    3. Post-stratification to provide higher precision and greater confidence in the results

The equations needed to calculate the realization rates and achieve confidence and precision from the sample data are contained in Appendix B.

[80] "EM&V Protocols and Requirements: 2011-2014." Ontario Power Authority. March 2011, p. 130.

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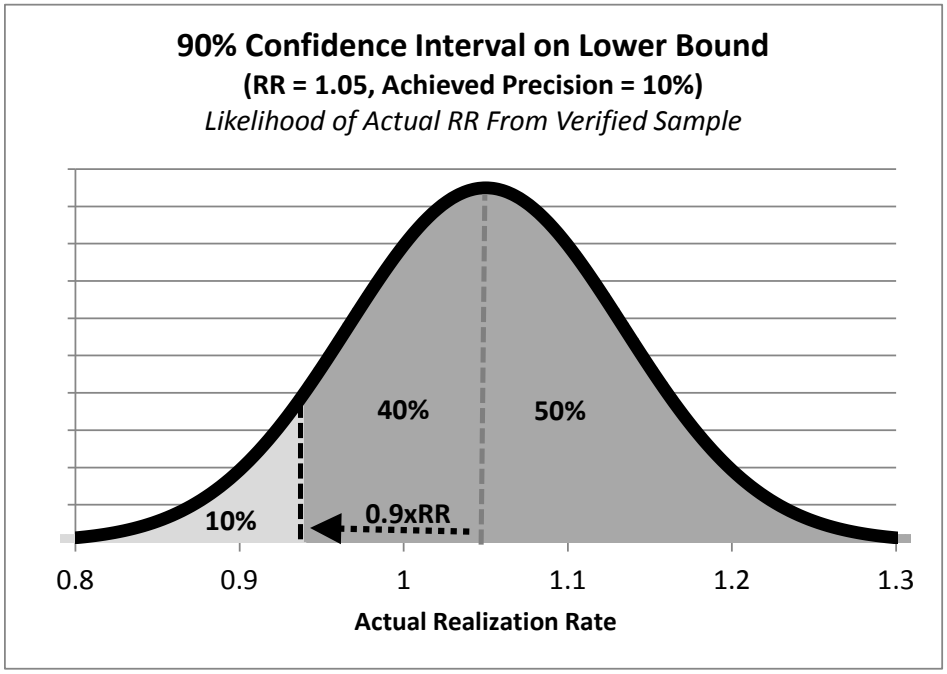
Appendix A. Explanatory Note on Confidence & Precision

The level of certainty associated with a statistical sample is most often stated in terms of a confidence interval. A confidence interval contains two components: confidence level and precision. Confidence level indicates the likelihood that an actual variable either exceeds a value (i.e., one-sided confidence) or falls within a range (i.e., two-sided confidence). Precision[81] indicates the bounding values of the corresponding confidence level. Confidence and precision are both necessary to sufficiently describe a confidence interval.[82]

At the time of this report, the target confidence interval for the design of the sample is established as 90/10 one-sided.[83] Figure 19 illustrates a 90% one-sided confidence interval with 10% precision for a sample whose realization rate (RR) is estimated to be 1.05.

Figure 19. Illustration of a 90% One-Sided Confidence Interval on the Lower Bound



[81] Relative precision (e.g., 10% of the estimate) is most often used to set the precision as a percentage of the estimated value rather than in absolute terms.

[82] Also, the shape (i.e., one-sided or two-sided) is often used to fully specify the confidence interval.

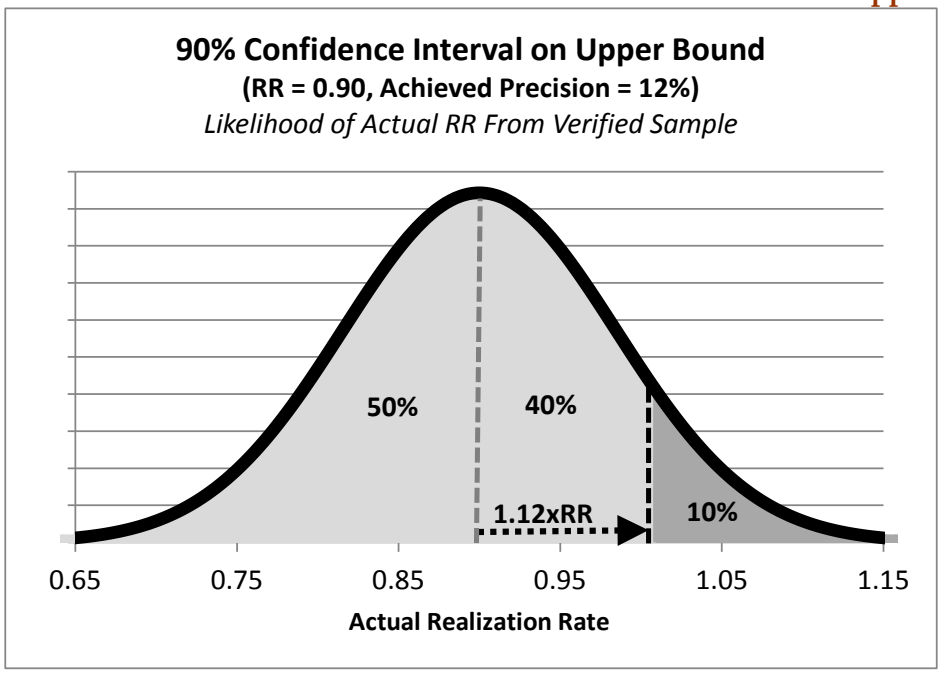
[83] Based on October 25, 2012 Technical Evaluation Committee decision the sample design should be based on a 90/10 one-sided confidence interval. Reporting of achieved confidence and precision should present the precision achieved for both the 90% one-sided and 90% two-sided intervals.

Reading off of Figure 19, this confidence interval can be interpreted as showing that:[84]

- There is a 10% likelihood that the actual value is less than 10% below the mean sample estimate of 1.05.
- There is a 40% likelihood that the actual value falls between 10% below the sample estimate and the sample estimate of 1.05.
- There is a 50% likelihood that the actual value exceeds the sample estimate of 1.05.

The reporting recommendations in Section 6.2 of the main report also call for the reporting of a one-tailed test around an upper bound and a two-tailed test at a 90% confidence level. These are illustrated in Figure 20 and Figure 21. Figure 20 illustrates a 90% one-sided confidence interval on the upper bound. For this illustration a different realization rate estimate is use that was used in Figure 19. In this case, the estimated realization rate is 0.90 and the level of precision achieved at the 90% confidence level is observed from the sample to be 12%. This confidence interval illustrates that the actual value has a 10% likelihood of exceeding the estimated realization rate of 0.90 plus 12% (i.e., exceeding a realization rate 1.01). This likelihood is illustrated by the dark shaded portion of the distribution in the Figure.

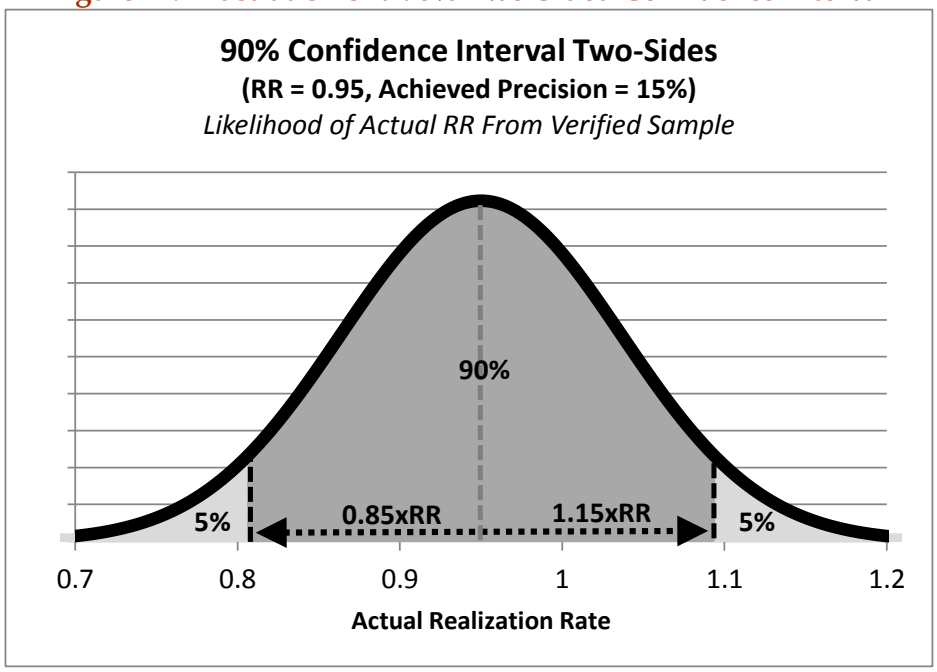
Figure 20. Illustration of a 90% One-Sided Confidence Interval on the Upper Bound



[84] This interpretation of the confidence interval is based on statistical inference, which assumes that the sample provides an adequate representation of the population.

Figure 21 illustrates a 90% two-sided confidence interval on a sample whose realization rate is observed to be 0.95 and whose achieved precision is 15%. The dark shaded area in the middle of the distribution represents the 90% confidence level that the actual value would fall between the bounds set dat plus or minus 15% of the observed sample estimate. There is only a 5% likelihood that the actual value would fall below the lower bound.

Figure 21. Illustration of a 90% Two-Sided Confidence Interval



Appendix B presents the detailed calculation methods for determining the confidence and precision achieved by a sample.

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Appendix B. Calculation Methods & Equations

B.1 Calculating Target Sample Confidence & Precision from Assumed CV

(Note: The formulae in this appendix are based on application of Lohr[85] and Cochran,[86] and are adapted to the vocabulary of the stratified realization rate problem of efficiency program evaluation.)

The standard error of the total savings of stratum h based on tracked ex ante savings[87] is given by,

$$SE'_h = FPC_h \times \frac{CV_h}{\sqrt{n_h}} \times TS'_h$$

Where CV_h[88] is the estimated coefficient of variation in stratum h, defined as the expected stratum standard deviation divided by the expected stratum mean.[89] Where FPC_h is the finite population correction factor of stratum h, n_h is the sample size of stratum h, and TS'_h is the tracked ex ante total savings in stratum h.[90] FPC_h is given by,

$$FPC_h = \sqrt{\frac{N_h - n_h}{N_h - 1}}$$

Where N_h is the population size of stratum h. The relative precision at the stated confidence level of stratum h is given by,

$$RP'_h = t_h \times \frac{SE'_h}{TS'_h} \times 100\%$$

Where t_h is the t-value derived from the confidence requirement and the sample size of stratum h. The overall standard error can be calculated by aggregating the sample according to each stratum's weighting (i.e., expected percent contribution to total program savings). The overall standard error of the tracked ex ante total savings of the program is given by,

[85] Lohr, S. L., "Sampling: Design and Analysis," Second Edition, 2010.
[86] Cochran, W. G., "Sampling Techniques," Third Edition, 1977.
[87] The prime symbol (apostrophe) is used to indicate that these values are based on tracked ex ante values rather than verified ex post values.
[88] In cases of ratio estimation, the error ratio is substituted for the coefficient of variation.
[89] The coefficient of variation may be based on savings or realization rate, as in the case of ratio estimation.
[90] Total tracked ex ante is not necessarily required to compute relative precision since this term is also in the denominator of the relative precision calculation.

$$SE'_P = \sqrt{\sum_h {SE_h}^2}$$

The overall relative precision at the stated confidence level is given by,

$$RP'_P = t_P \times \frac{SE'_P}{TS'_P} \times 100\%$$

Where t_P is the t-value derived from the confidence requirement and the overall sample size in the population, and TS'_P is the estimated total savings across all strata based on verified ex post savings.

B.2 Calculating Achieved Realization Rates

Defining $x_{i,h}$ as the tracked ex ante estimate and $y_{i,h}$ as the verified ex post estimate of a single sample point i in stratum h, the effective realization rate of a single sample point i in stratum h is given by,

$$RR_{i,h} = \frac{y_{i,h}}{x_{i,h}}$$

The stratum sample realization rate of stratum h is the sum of all verified ex post savings in the sample of stratum h divided by the sum of all tracked ex ante savings in the sample of stratum h, given by,

$$RR_h = \frac{\sum_{i \in h} y_{i,h}}{\sum_{i \in h} x_{i,h}}$$

In stratified ratio estimation, the stratum realization rate should be applied to the tracked ex ante estimates of each member j[91] of the full population of stratum h to produce the total savings estimate for stratum h. The verified total savings estimate for stratum h is the sum of all tracked ex ante estimates in stratum h multiplied by the stratum realization rate, given by,

$$TS_h = RR_h \times \sum_{j \in h} x_{j,h}$$

[91] Note that i members of the sample are a subset of j total members of the applicable population.

The verified total savings of the program can be calculated by aggregating strata results. The program verified total savings estimate is given by,

$$TS_P = \sum_h TS_h$$

The overall realization rate across all strata is the verified total savings of the program divided by the tracked ex ante total savings of the program, given by,

$$RR_P = \frac{TS_P}{TS'_P}$$

B.3 Calculating Achieved Sample Confidence & Precision

A predicted estimate can be made for each member of stratum h based on the stratum realization rate, where the predicted estimate is the tracked ex ante estimate of each member of the stratum multiplied by the stratum realization rate. A residual error can be calculated for each sample point in stratum h based on the difference between the verified ex post savings of the sample point and the predicted estimate. The residual of each sampled point is given by,

$$e_{i,h} = y_{i,h} - RR_h \times x_{i,h}$$

The sample variance[92] of the verified total savings in stratum h is derived from the stratum residuals, given by:

$$V_h = \frac{1}{n_h - 1} \sum_{i \in h} e_{i,h}^2$$

The standard error of the sample of stratum h can be calculated using the stratum sample variance and the finite population correction factor. The standard error of the verified total savings of stratum h is given by,

$$SE_h = FPC_h \times \frac{\sqrt{V_h}}{\sqrt{n_h}} \times N_h$$

[92] Sample variance is based on residuals of the verified measurement compared to the predicted estimate using the stratum realization rate when applying ratio estimation.

The relative precision for the stated confidence level of the verified estimate of stratum h is given by,

$$RP_h = t_h \times \frac{SE_h}{TS_h} \times 100\%$$

The resulting confidence interval can be stated in terms of the realization rate or the total estimate. The absolute two-sided confidence interval for the stratum realization rate and verified total savings of stratum h is given by,

$$RR_h \pm (RR_h \times RP_h) \quad and \quad TS_h \pm (TS_h \times RP_h)$$

The absolute one-sided confidence interval for the stratum realization rate and verified total savings of stratum h is given by,

$$> RR_h - (RR_h \times RP_h) \quad and \quad > TS_h - (TS_h \times RP_h)$$

The standard error of the verified total savings of the program is given by,

$$SE_P = \sqrt{\sum_h SE_h^2}$$

The overall relative precision at the stated confidence level is given by,

$$RP_P = t_P \times \frac{SE_P}{TS_P} \times 100\%$$

The absolute two-sided confidence interval for the overall program realization rate and verified total savings of the program is given by,

$$RR_P \pm (RR_P \times RP_P) \quad and \quad TS_P \pm (TS_P \times RP_P)$$

The absolute one-sided confidence interval for the overall program realization rate and verified total savings of the program is given by,

$$> RR_P - (RR_P \times RP_P) \quad and \quad > TS_P - (TS_P \times RP_P)$$

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Appendix C. Summaries of Custom C&I Samples in Selected Jurisdictions

This appendix presents brief summaries of the sampling approaches used in custom commercial and industrial (C&I) programs in selected jurisdictions. The reviewed approaches are all contained within publicly available documents. Because the reviewed documents 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. Eight jurisdictions are discussed below. Published information on the sampling procedures allowed for a useful summary to be produced.

C.1 Summary from Illinois (ComEd)

The Commonwealth Edison Company (ComEd) Smart Ideas for Your Business program offers all eligible commercial and industrial customers financial incentives for upgrading their facilities with energy-efficient equipment. The program offers prescriptive incentives, available for qualified equipment commonly installed as part of retrofit and equipment replacement projects, or custom incentives, available for less common and more complex energy-saving measures. Examples of custom projects include heating, ventilating, and air conditioning (HVAC) measures (such as chiller upgrades and centralized thermostat control systems), large commercial refrigeration measures, air compressor system upgrades, high-rise building domestic water pumping systems, industrial process renovations, and non-prescriptive lighting measures. In 2011, the custom incentive levels were $0.03/kilowatt-hour (kWh) for equipment with less than a five-year life and $0.07/kWh for equipment with a five-year life or greater.[93] These incentive levels were applied for the first $100,000 in incentives and then reduced by half for the next $100,000, up to the project cost cap. In 2011, ComEd provided financial incentives to 887 projects. Of these, 32 projects were selected for evaluation to achieve confidence and precision targets of 90% and 8% over the three-year program.[94]

A two-stage sampling methodology was implemented, with the first projects being sampled in April of 2011 and the remaining projects sampled in July. The sampling approach stratified the population of projects by project size. All custom projects were sorted into three strata based on *ex ante* energy (kWh) savings, such that each stratum contained one-third of the total claimed energy savings.[95] The evaluation sample was drawn to represent the population distribution by stratum. Figure 22 shows the total number of projects and the evaluation sample by stratum. This sample represents 100% of the population's claimed energy savings in the first stratum,

[93] Any project involving Energy Management System programming is eligible for the $0.03/kWh incentive. To receive the $0.07/kWh custom incentive, equipment must have a minimum payback of one year and a maximum payback of seven years.

[94] A thirty-third project had been selected but after the site-visit it was moved into the following program year (PY4).

[95] Note that ComEd's custom program application does not require that applicants submit an estimate of savings, suggesting that the claimed savings may be underestimated. In addition, more projects may be assigned to stratum 3, resulting in a less precise estimation of *ex post* gross impacts.

59% in the second, and 5% in the third. In total, the 32 projects represent 45% of the program's custom projects' *ex ante* energy savings.

Figure 22. ComEd 2011 C&I Sample Summary

Sampling Stratum	Total Number of Projects	Evaluation Sample
1	2	2
2	27	15
3	858	15
Total	**887**	**32**

Source: Navigant Review of Evaluation Report[96]

C.2 Summary from Michigan (DTE Energy)

The DTE Energy C&I non-prescriptive program offers business customers financial incentives for the installation of "innovative and unique" energy efficiency equipment and controls. Examples of custom measures include energy management system controls, variable-speed air compressors, and ultrasonic HVAC humidification systems. Ineligible customer measures include on-site electricity generation, renewable energy, peak-shifting, fuel switching, or changes in operational/maintenance practices that do not involve capital costs. The custom incentive levels are $0.08/kWh, based on the first year of estimated energy savings, up to 50% of the project cost. Projects require a one-year minimum payback and an eight- year maximum payback.

In 2010, DTE Energy provided financial incentives for 515 energy efficiency measures associated with 381 unique projects. Of these projects, 56 were selected for evaluation to achieve confidence and precision targets of 90% and 10%, respectively, at the program level. This sample of 56 was based on a proportional sampling of measures from each of the three major technology groups: custom lighting, custom electric and custom gas.[97] Figure 23 shows the number of energy efficiency measures, unique projects, and evaluation sample size by group. The sample of custom lighting measures, custom electric measures, and custom gas measures represents 60%, 45%, and 90% of *ex ante* gross energy savings, respectively, for the population.

[96] "Evaluation Report: Smart Ideas for Your Business Custom Program." (Program Cycle 2010-2011.) Commonwealth Edison Company. Prepared by Navigant Consulting, Incorporated. May 16, 2012.

[97] Due to the small sample of "custom electric", several additional measure types were consolidated into this group to avoid a potential distortion in the realization rate. For example, custom HVAC, custom motors, and measures installed through a grocery RFP are included in the "custom electric" category.

Figure 23. DTE Energy 2010 Custom C&I Sample Summary

Sampling Stratum	Total Number of Measures	Total Number of Projects	Evaluation Sample
Custom Lighting	321	252	27
Custom Electric	150	93	9
Custom Gas	44	36	20
Total	**515**	**381**	**56**

Source: Navigant Review of Evaluation Report[98]

C.3 Summary from Massachusetts (National Grid, NSTAR, and Western Massachusetts Electric Company)

The C&I energy efficiency program run by the Massachusetts Program Administrators offers financial incentives to business customers for installing energy-efficient equipment. Custom projects are categorized as either a comprehensive design (CD) project or a comprehensive chiller (CC) project. CD projects typically involve the new construction of commercial, industrial, or municipal buildings that include at least four energy conservation measures (ECMs) that achieve a minimum of 20% energy savings relative to code.[99] CC projects typically involve the installation of a new chiller and multiple other ECMs in an existing building that achieve a minimum of 20% savings.

In 2008 and 2009, 25 custom projects were installed in National Grid, NSTAR, and Western Massachusetts Electric Company (WMECO) service territories.[100] Custom projects were stratified for National Grid, NSTAR, and WMECO separately, resulting in three strata for National Grid and one stratum for both NSTAR and WMECO. Although not specified in the evaluation report, it appears that stratification was based on project size. Figure 24 lists the number of projects and evaluation sample in each stratum by program administrator. Of these projects, five were selected for evaluation to achieve confidence and precision targets of 90% and 10%, respectively, three from National Grid and one each from NSTAR and WMECO.

[98] "Reconciliation Report for DTE Energy's 2010 Energy Optimization Programs." DTE Energy Company. Prepared by Opinion Dynamics Corporation. April 15, 2011.

[99] Examples of ECMs are building envelope upgrades, lighting fixtures and controls, cooling system upgrades, and Energy Management System controls.

[100] Twenty-two custom projects occurred in National Grid service territory, 2 in NSTAR, and 1 in WMECO.

Figure 24. Massachusetts 2008-2010 Custom C&I Sample Summary

Sampling Stratum	Total Number of Projects	Maximum Gross Savings (kWh)	Evaluation Sample
National Grid, 1	12	332,480	1
National Grid, 2	6	608,237	1
National Grid, 3	4	1,108,409	1
NSTAR, 1	2	3,352,840	1
WMECO, 1	1	496,579	1

Source: Navigant Review of Evaluation Report[101]

C.4 Summary from New Mexico (New Mexico Public Service Company and New Mexico Gas Company)

New Mexico Gas Company and the Public Service Company of New Mexico have programs that offer financial incentives to commercial and industrial customers for custom energy efficiency projects.[102] The custom C&I program offered by the New Mexico Gas Company is called "Commercial Solutions" and provides low-flow faucet aerators and pre-rinse spray valves at no cost, as well as a $0.75/therm incentive for custom measures (e.g., water heating, HVAC, building envelope, and industrial process improvements). The custom C&I program offered by the Public Service Company of New Mexico is called the "Commercial Comprehensive Program" and provides rebates for a range of prescriptive and custom measures. Projects are classified as either retrofit, new construction, or QuickSaver direct-install.

The sampling methodology to evaluate C&I programs utilizes stratified random sampling to achieve 90% confidence and 10% precision levels. Projects are stratified by project size. New Mexico Gas Company stratified into three strata. The Public Service Company of New Mexico implemented the sampling strategy for retrofit, new construction, and quick-saver projects separately. Due to the large population of projects for retrofit and QuickSaver, projects were stratified into five strata, while new construction projects were stratified into three strata. Figure 25 and Figure 26 show the number of projects and evaluation sample by stratum.

[101] "Impact Evaluation of 2008 and 2009 Custom CDA Installations." Massachusetts Energy Efficiency Advisory Council. Prepared by KEMA and SBW Consulting Incorporated. June 7, 2011.

[102] El Paso Electric Company also offers a custom C&I program. However, during 2010 and 2011 there were no participants and as a result an evaluation of the program was not conducted.

Figure 25. New Mexico Gas Company 2011 Custom C&I Sample Summary

Sampling Stratum	Total Number of Projects	Evaluation Sample
< 1,000 therms	16	3
1,000 – 5,000 therms	7	3
> 4,000 therms	5	5
Total	**28**	**11**

Source: Navigant Review of Evaluation Report[103]

Figure 26. Public Service Company of New Mexico 2011 Custom C&I Sample Summary

Retrofit		
Sampling Stratum	**Total Number of Projects**	**Evaluation Sample**
< 26.5 MWh	95	5
26.5-50 MWh	38	4
50-150 MWh	48	4
150-500MWh	29	5
>500 MWh	9	9
Total	**224**	**27**

QuickSaver		
Sampling Stratum	**Total Number of Projects**	**Evaluation Sample**
< 10 MWh	192	4
10-20 MWh	150	4
20-40 MWh	88	4
40-95 MWh	44	4
> 95 MWh	10	10
Total	**484**	**26**

New Construction		
Sampling Stratum	**Total Number of Projects**	**Evaluation Sample**
< 70 MWh	12	3
70-250 MWh	9	4
> 250 MWh	2	2
Total	**23**	**9**

Source: Navigant Review of Evaluation Report[104]

C.5 Summary from Pennsylvania (PECO Energy)

The PECO Energy Company Smart Equipment Incentives program offers financial incentives for installing energy-efficient equipment in commercial and industrial facilities and in master-metered multifamily residential buildings. The program offers incentives for both prescriptive and custom measures. Examples of custom projects include energy management systems,

[103]"Evaluation of 2011 DSM Portfolio." New Mexico Gas Company. Prepared by ADM Associates Incorporated. June 2012.

[104]"Evaluation of 2011 DSM & Demand Response Portfolio." Public Service Company of New Mexico. Prepared by ADM Associates Incorporated. March 2012.

compressed air systems, process equipment and chillers, industrial systems, whole building systems, and outdoor lighting. Custom incentive levels are $0.12/kWh for estimated on-peak energy savings and $0.08/kWh for estimated off-peak energy savings, up to 100% of project costs.[105]

In 2010, PECO provided financial incentives to 1,085 non-multi-tenant projects and 490 multi-tenant projects. Of these projects, 39 were selected for evaluation to achieve confidence and precision targets of 85% and 10%, respectively, at the program level.[106] The sample is stratified by project size, based on *ex ante* energy savings, and by project-type (lighting, non-lighting, custom). A three-stage sampling strategy was implemented, with the first stage occurring after the end of Q2, the second stage after Q3, and the third stage after Q4.[107,108] Within the sample, custom projects make up the majority of stratum 1, accounting for 49% of *ex ante* energy savings for the sample population.[109]

C.6 Summary from Ohio (AEP Ohio)

AEP Ohio offers commercial and industrial customers energy efficiency incentives through a number of programs. The custom program provides financial incentives for "less common or more complex energy-saving measures" that are installed as part of a qualified retrofit project or equipment replacement project. Examples of custom measures include lighting retrofits, HVAC measures such as VFDs, equipment controls, and process efficiency improvements. Custom incentive levels are based on both energy (kWh) and demand (kW) savings in the first year. Specifically, the incentive levels are $0.08/kWh, $100/kW, up to 50% of the project cost. In 2011, AEP Ohio provided financial incentives to 220 custom projects. Of these, 54 projects were selected for evaluation.

The sampling methodology stratified projects both by geography and by project size. At the time, AEP Ohio had gone through a merger of two regional operating companies so that participants in the custom program were distributed across two rate zone territories. The sample design was conducted separately for each rate zone, targeting confidence and precision levels of 90% and 10%, respectively, for each zone. A two-stage sampling methodology was implemented, with the first wave of projects sampled in November of 2011 and the second wave sampled in February of 2012. Projects were first separated by zone, then stratified based on *ex ante* energy (kWh) savings. Projects were assigned to one of three strata such that there

[105] On-peak hours include 12pm-8pm, June 1 – September 30 (excluding holiday weekdays). Off-peak hours include 8:01pm-11:59am, June 1-September 30, and all hours from October 1-May 31. https://peco.icfi.com/sites/peco/files/2011_PECO_CUSTOM_Incentive_Levels.pdf

[106] The evaluation plan targeted confidence and precision levels of 85% and 15%, respectively. However, the final sample design allowed for 85/10 confidence and precision targets.

[107] The first stage included projects implemented in both Q1 and Q2 due to low levels of participation in the program during Q1.

[108] Note that PECO reports unverified savings quarterly.

[109] Lighting and non-lighting measures account for 19% and 32%, respectively.

was a relatively even distribution of cumulative standard deviation in energy savings between strata. Figure 27 shows the number of total projects and the number of projects in the evaluation sample for each zone and stratum. In total, the evaluation sample represents 62% of *ex ante* gross energy savings for the population.

Figure 27. AEP Ohio 2011 Custom C&I Sample Summary

Sampling Stratum	Total Number of Projects	Evaluation Sample
Zone 1, Stratum 1	5	5
Zone 1, Stratum 2	19	7
Zone 1, Stratum 3	85	12
Zone 2, Stratum 1	8	5
Zone 2, Stratum 2	18	11
Zone 2, Stratum 3	85	14
Total	**220**	**54**

Source: Navigant Review of Evaluation Report[110]

C.7 Summary from Maryland (covers five Maryland utilities)

The five EmPOWER Maryland utilities (Baltimore Gas and Electric, Potomac Electric Power Company, Delmarva Power, Southern Maryland Electric Cooperative, and Potomac Edison) offer large commercial and industrial customers financial incentives for the installation of efficiency measures that are complex and/or unique, such as commercial HVAC and industrial process improvements. Baltimore Gas and Electric (BGE) and Southern Maryland Electric Cooperative (SMECO) offer rebates for up to 50% of retrofit projects and up to 75% of the incremental cost of new construction projects. Potomac Electric Power Company (PEPCO) and Delmarva Power (DPL) programs were implemented jointly and offer $0.16/kWh for energy savings in the first year.[111] Potomac Edison (PE) offers $0.05/kWh of *ex ante* energy savings. The target evaluation sample for each utility was 12 projects to achieve confidence and precision levels of 80% and 20%, respectively. At the time the evaluation samples were drawn, only BGE had enough participants to reach the targeted sample of 12. PEPCO/DPL had 10 custom projects completed, SMECO had 7, and PE had 11. For these utilities, the entire population was used as the evaluation sample.[112]

For BGE, the sampling strategy calculated the percentage of population energy (kWh) and demand (kW) savings for each project using equal weights. These percentages were used to sort the population of projects into three strata such that each stratum represented approximately one-third of population savings. Random numbers were then assigned to projects within each

[110] "Program Year 2011 Evaluation Report: Business Custom Program." AEP Ohio. Prepared by Navigant Consulting, Incorporated. May 10, 2012.

[111] As a result, participants in PEPCO and DPL's programs were combined into a single sample.

[112] The final evaluation sample for PEPCO/DPL was reduced to eight due to barriers in doing on-site verification for two custom projects.

stratum. Sample projects from each stratum were selected based on the random number designation. For BGE, the evaluation sample represents 58% of *ex ante* energy savings for the population.

C.8 Summary from Vermont (Efficiency Vermont)

Efficiency Vermont offers financial incentives for installing energy-efficient equipment in commercial and industrial facilities as well as multi-family buildings. The evaluation was conducted for two program years, 2007 and 2008. The sample size was chosen to achieve an 80% confidence level and 10% precision level for the entire portfolio of Efficiency Vermont programs.

Sampling occurred in two stages, with the first wave including projects completed by April 30, 2008, and the second wave including projects completed during the remainder of 2008. The sampling methodology categorizes projects by market type (retrofit or new construction/market opportunities) and end use (lighting, HVAC, and other).

The sample of retrofit projects includes projects of all end uses, whereas the evaluation sample of new construction/market opportunities projects only includes lighting projects. Projects were stratified into three strata based on *ex ante* peak demand savings. Because demand reductions are claimed separately for winter and summer, the population of projects/end uses was further stratified by season. In particular, if the estimated peak reduction was higher during winter, projects/end uses were assigned to "winter." If the estimated peak reduction was higher during summer or was roughly equivalent during winter and summer, projects/end uses were assigned to "summer/non-seasonal." Within each stratum, a random number was assigned to each project/end use and ordered. The evaluation sample was then selected from the top of each group. Figure 28 shows the total number of retrofit and NC/MOP projects, as well as the evaluation samples stratified by project size and seasonality.

Figure 28. Efficiency Vermont 2007-2008 Custom C&I Sample Summary

	Total Number of Projects		Evaluation Sample			
Sampling Stratum	**Retrofit**	**NC/MOP**	**Retrofit, Winter**	**Retrofit, Summer**	**NC/MOP, Winter**	**NC/MOP, Summer**
0.8-5 kW	263	652	8	8	15	15
5-35 kW	244	315	16	17	23	26
> 35 kW	64	35	49	49	21	23
Total	**571**	**1,002**	**73**	**74**	**59**	**64**

Source: Navigant Review of Evaluation Report[113]

[113]"Verification of Efficiency Vermont's Energy Efficiency Portfolio for the ISO-NE Forward Capacity Market." Vermont Department of Public Service. Prepared by West Hill Energy and Computing Incorporated. July 29, 2010.

Independent Audit of Enbridge Gas Distribution 2012 DSM Program Results

Revised Final Report

energy & resource solutions

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January 16, 2014

EXECUTIVE SUMMARY

This report presents the findings of the third-party independent audit of the Enbridge Gas Distribution's (Enbridge) savings and payment mechanism claims for their energy efficiency program performance during the calendar year ending December 31, 2012.

Objectives

The audit's primary objective is to provide an opinion on the demand side management variance account (DSMVA), the lost revenue adjustment mechanism (LRAM), and the demand side management incentive deferral account (DSMIDA) amounts proposed by Enbridge Gas Distribution. When the Enbridge-reported amounts differ from what the auditors believe to be correct, the auditors will calculate alternative values. The audit has the secondary objective of recommending methodological changes to the program administration, input assumptions, verification, and audit processes for the future.

Methodology

The auditors began the assessment by conducting preliminary reviews of Enbridge's custom project savings verification (CPSV) reports for the custom commercial and industrial programs, meeting with Enbridge program managers and key technical evaluation support staff including in-person and teleconference meetings with the CPSV firms. Drafting of the work plan for the 2012 audit began immediately after the kick-off meeting and was distributed to Enbridge and the audit committee on February 8, 2013.

The core of the large commercial and industrial (C&I) CPSV process followed. This year's audit process began earlier than it did in previous years, allowing the auditors the opportunity to work with the CPSV firms in the execution of their work and preparation of their reports. The sampled projects were broken into two Waves. Wave 1 included projects that were completed in between January and September 2012; Wave 2 included projects that were completed throughout the 2012 program year.

The CPSV review included desk review of the Wave 1 and Wave 2 sample projects for both commercial and industrial projects. The auditors were able to provide feedback on the Wave 1 draft reports, which in turn informed Wave 2 project reports. Regularly scheduled conference calls provided the opportunity to review the CPSV firm's progress and approach in real time. Auditors reviewed the (TAPS) program reports for validity and comprehensiveness of analysis to ensure that they reflected the Ontario Energy Board's (OEB) guidance and incorporated the most recent recommendations. The auditors reviewed the cumulative cubic meter (CCM) spreadsheet (formerly TRC) and LRAM workbook to validate the calculation of CCM, DSMVA,

LRAM, and DSMIDA. The auditors also compared the workbook results with those in Enbridge's Draft Evaluation Report for proper representation. The CCM spreadsheet review also included a review of the resource acquisition and low-income program results and metrics for compliance with Board-approved assumptions, supporting documentation, and accuracy of data entry. The Market Transformation program participant paperwork was reviewed to verify the number of participants enrolled.

Lastly, methodological recommendations were considered for individual verification activities, administrative procedures, and future evaluation efforts.

Findings

Table ES-1 summarizes the individual changes made that affected the calculated net lifetime m^3 of gas savings. Table ES-2 summarizes the impact of these changes on the resource acquisition, market transformation, and low-income programs.

Table ES-1. Summary of Adjustments by Program Type

Description of Adjustment	Original Value	Audit Value	CCM Adjustment for DSMIDA ($)	Audit Report Ref. Page(s)
Audit Adjustments to Results of Custom Commercial, Industrial, and Multi-Residential Resource Acquisition Programs				
TAPs reduction factor % for non-installs and removals adjusted to be consistent with verification report	TAPS Showerhead 2.0 - 2.5 = 61% TAPS Showerhead 2.6+ = 61% TAPS - Bathroom Aerators = 78% TAPS - Kitchen Aerator = 69% 80,324 participants	TAPS Showerhead 2.0 - 2.5 = 59.3% TAPS Showerhead 2.6+ = 59.3% TAPS - Bathroom Aerators = 77.5% TAPS - Kitchen Aerator = 66.8% 82,325 participants	1,718,874	30
Industrial program adjustment factor	-1.9%	-1.87%	101,636	22
Commercial and multi-residential program adjustment factor impact on commercial and multi-residential programs	+1.4%	-4.41%	-34,325,008	22
Updates to CCM calculation spreadsheet to remove hardcoding of results for sampled projects and apply adjustment factor calculated with sample weights to all projects in sample frame	995,052,197	998,758,970	3,706,773	23
Community Energy Retrofit	5,296,300	5,296,300	None	29

Description of Adjustment	Original Value	Audit Value	CCM Adjustment for DSMIDA ($)	Audit Report Ref. Page(s)
Commercial deep energy savings	209	209	None	10
Residential deep energy savings	25%	25%	None	29
Custom resource acquisition program totals			**-28,797,726**	
Audit Adjustments to Results of Low-Income Resource Acquisition Programs				
Commercial and multi-residential program adjustment factor change impact on low-income multi-residential programs	+1.4%	-4.41%	-1,927,431	32
Low-income resource acquisition program totals			**-1,927,431**	
Audit Adjustments to Market Transformation Program Results				
None	None	None	None	None
Totals, all adjustments	**–**	**–**	**-30,725,157**	

Table ES-2. Summary of Adjustments to Net Annual Gas m^3 and DSMIDA

Affected Program	CCM Adjustment (m^3)	DSMIDA Adjustment ($)
2012 resource acquisition programs	-28,797,726	-$499,201
2012 market transformation programs	N/A	$0
2012 low-income programs	-1,927,431	-$114,441
Totals	**-30,725,157**	**-$613,643**

Overall, the adjustments reduced the DSMIDA by 6.5% and the CCM by 2.8% compared to the values claimed by Enbridge in the 2012 Draft Evaluation Report. The nature of the adjustments generally can be characterized as technical corrections to aggregate calculation methods and minor revisions to calculations, as opposed to being modifications of inflated assumptions or other biasing factors. Overall, auditors found Enbridge's efforts to be diligent and reflective of a mature DSM program with a balanced effort to estimate actual savings.

Savings Verification Statement

We have audited the Draft Evaluation Report, CCM savings, DSMIDA, LRAMVA, and DSMVA of Enbridge Gas Distribution for the calendar year ending December 31, 2012. The Draft Evaluation Report and the calculations of CCM, DSMIDA, LRAMVA, and DSMVA are the responsibility of the company's management. Our responsibility is to express an opinion on these amounts based on our audit.

We conducted our audit in accordance with the rules and principles set down by the OEB in its Decision with Reasons dated June 30, 2011, in EB-2008-0346. 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, accurate in all material respects, and follow the rules and principles set down by the OEB that are applicable to the 2012 DSM programs of Enbridge Gas Distribution:

- CCM savings – 1,068,358,487 m3
- DSMIDA amount recoverable – $8,789,917
- LRAMVA amount recoverable – $40,652(to be paid to the ratepayers)
- DSMVA amount recoverable – $2,506,510 (to be paid by the ratepayers)

For comparison, the values reported by Enbridge for 2012[1] were:

- CCM savings – 1,099,083,644 m^3
- DSMIDA amount recoverable – $9,403,559
- LRAMVA amount recoverable – $38,258 (to be paid to the ratepayers)
- DSMVA amount recoverable – $2,506,510 (to be paid by the ratepayers)

Recommendations

In addition to quantifying the savings and recoverable amounts, auditors identified thirteen opportunities for Enbridge to enhance program operation and verification procedures going forward. The recommendations are briefly summarized below and are addressed in more detail in the body of the report.

1. Further refine the custom verification protocols to include more intensive investigation of projects, including post-retrofit equipment performance measurement over time, and disallow Enbridge's eTools software as a CPSV tool without first independently verifying the underlying formulae. This year's terms of reference (TOR) for CPSV contractors did include language suggesting additional on-site data collection, and the rigor was higher than in prior years, but more stringent language and direction on measurement and verification (M&V) activities within the TOR is needed to further improve the CPSV process.

[1] CCM and DSMIDA values from *Demand Side Management 2012 Draft DSM Evaluation Report*, Enbridge Gas Distribution Inc., DSM Research and Evaluation, April, 2012 (DSMIDA amounts combined for resource acquisition and scorecard programs). The LRAM amount is from 2011 FE-PE_Actual vs Budget_LRAM_Audit_Step 4_May 15.xlsx, provided to ERS from Rodney Idenouye, Enbridge DSM Research and Evaluation, April 14, 2013. The DSMVA amount is from *2012 Demand Side Management Revised Annual Report, January 10, 2014*. The prior version of the annual report, the *2012 Demand Side Management Draft Evaluation Report*, April 15, 2013, reported a net DSMVA payment due to ratepayers of $303,490. An accounting correction to the actual amount that was built into rates was responsible for the change to the final value.

2. Define what project milestone is used to determine a complete project and its completion date. Revise administrative procedures to support this new definition. Several projects within the commercial CPSV sample were still undergoing commissioning processes after December 31, 2012.
3. Correct the post-verification weighting procedure to exclude the unverified "very small" stratum from the denominator of the realization rate calculation.
4. Use the sample design contractor's sample- and energy-weighted average realization rate results in the Draft Evaluation Report and related calculations instead of the CPSV reports' energy-weighted average realization rates. This may require that additional time be built into the CPSV process to allow for the transfer and recalculation of data.
5. Consider a separate evaluation process for large commercial new construction projects. As identified in last year's audit, the commercial new construction project savings are based on energy models generated and reviewed by third parties. This methodology is appropriate for estimating savings during the review process. Historically, the evaluation effort has been limited to a cursory review of model inputs and a site visit to verify that the proposed equipment is installed as per the design. This evaluation methodology lacks rigor, as it essentially verifies the model assumptions but does not refine the analysis and savings to take actual performance into account. Alternate methodologies such as in-situ metering or post-install modeling reconciled to utility consumption data will provide more confidence in the evaluated and audited savings for this sector. An extended evaluation and audit cycle for these projects will need to be considered if these alternate methods are adopted, as they require the building be occupied for some period (a minimum of 6 months and ideally 18 months) so reasonable, accurate data can be collected. This may take the form of a verification independent of the normal cycle, with a one-year lag. The more intensive verification would increase the CPSV cost but should be considered in future program framework.
6. Consider research on Ontario commercial new construction standard practices for use in baseline energy use estimation**.** Multiple CPSV-verified projects claimed savings reductions in excess of 75% of the baseline with relatively conventional technologies. While using code as baseline is typical practice in jurisdictions throughout North America, the low code requirements compared to likely standard practice in Ontario suggests that either Enbridge should conduct research to determine if code is a reasonable baseline representing standard practice or the program should use a net-to-gross factor that specifically accounts for the likely high free ridership compared to a code baseline.
7. Establish a policy and analysis procedure for fuel-switching projects to account for the province-level impact on net fuel use and emissions reductions. Starting in 2012, Enbridge's performance metrics are based solely on gas savings. CCM does not inherently account for the electric penalty associated with a fuel switching measure; it just measures the gross measure gas savings.
8. Provide additional clarification on the savings target increase mechanism linked to the Run *it* Right program as detailed in the Settlement Agreement. The document notes that

savings targets will be revised upward if funds are "shifted" from the Run *it* Right program. There is no formal procedure through which funds are shifted; therefore, it is difficult to identify this trigger when some programs/portfolios are overspent and others are underspent.

9. Establish a future Run *it* Right verification process. Once the Run *it* Right Program begins to generate savings, it will need to be evaluated. As the program is based on pre- and post-install utility bill analysis, the typical CPSV process may not be appropriate. The auditors recommend that the verification include a review of Enbridge's savings methodology and a desk review of a sample of projects to assess compliance with the methodology.
10. Review the measure lives associated with the Community Energy Retrofit program. As discussed in Section 2.2.1, there was some discrepancy in the nature of the program between Enbridge and the Audit Committee. It must be determined if the projects are to be treated holistically with a single blended or aggregated measure life, or if each measure is to be assessed on its own, each with a unique measure life. In either case, the measure life or lives should be documented within future DSM plans.
11. Review the administrative process associated with the Community Energy Retrofit program. Enbridge indicated that they do not collect measure level information on the submitted projects, but the 2012 DSM plan states that this data is to be collected on a monthly basis. Enbridge states that they are working with NRCan to provide the details required to capture individual measure savings post-retrofit.
12. Require documented pre-approval for all large and/or custom incentives prior to project completion**.** In the course of reviewing completion dates and related paperwork of custom projects to affirm eligibility for savings, the auditors learned that some custom projects do not receive pre-approval before project completion when ESCs are working closely with established participants. This was found to be the case in one of the sampled custom commercial projects. In our experience, such applicants are more likely to be free riders than those who apply for incentives before or at least closer to the time of decision-making. While this particular project may just be a case of lagging paperwork, requiring pre-approval has proven to be a good mechanism to reduce this type of free ridership.
13. As discussed with Enbridge and the Audit Committee, it is ERS's opinion that a TEC subsection is not necessary in the Final Annual Report because the conversations and activities of the TEC will not impact the CCM or financial mechanisms reported on in this Audit Report.

1 INTRODUCTION AND OBJECTIVES

Enbridge operates a series of demand side management (DSM) programs to encourage customers to use less natural gas and, in some cases, less electricity and water. The company receives a combination of direct cost recovery and performance incentive payments for DSM program delivery. OEB and the consultative group's audit committee (AC) require independent third-party review of Enbridge's Draft Evaluation Report and supporting calculations to ensure that savings claims and performance-based payment calculations are correct.

1.1 Objectives

The primary objective of this audit is to review the Enbridge claims for lifetime CCM, DSMIDA, LRAM, and DSMVA for the calendar year ending December 31, 2012, and to express an independent opinion on these amounts. Enbridge contracted with ERS to perform the audit as per the auditor selection process outlined in EB-2011-0295 Joint Terms of Reference on Stakeholder Engagement. If the Enbridge-reported amounts differed from what ERS believed to be correct, ERS presented alternative values for the AC to consider. As noted in the OEB DSM Framework, the audit has the secondary objective of recommending forward-looking evaluation work for consideration. The audit report authors have interpreted this objective to also include recommending methodological changes to the administrative, verification, and audit processes.

This audit was conducted in accordance with the rules and principles set forth by the OEB in its Decision with Reasons dated June 30, 2011, in EB-2008-0346.

1.2 Methodology

The methodology followed by auditors is detailed in "Appendix A: Independent Audit of Enbridge Gas Distribution 2012 DSM Program Results, Final Work Plan" and briefly summarized here.

Enbridge delivered the first program files, the CPSV Wave 1 draft report, to ERS for review on January 17 and 18, 2013. Wave 2 reports were delivered in mid-February. This is significantly earlier than last year's audit cycle, for which the first documentation was delivered on March 26, 2012. The auditors then traveled to Enbridge's office in Toronto to meet with Enbridge staff on January 23 and 24. Enbridge arranged meetings between the auditors and all principal program managers and Enbridge's key technical evaluation support staff and in-person and conference-call meetings with two of the three CPSV firms[2]. The review process included detailed walk-throughs of existing programs with an emphasis on program changes from 2011. Examination of Enbridge's DSM analysis, reporting, and tracking system (DARTS) was not in scope. The auditors also participated in a conference call with the AC as part of the audit

[2] At the time of the meeting only two of the three CPSV firms had been hired. Enbridge hired BII at a later date to review a sample of projects that had been assigned to MMM, and where there was a perceived conflict of interest, as an affiliate of MMM had been involved in the implementation of the project.

kickoff. Additional supporting documentation, including the Draft Evaluation Report, CCM and LRAM spreadsheets, TAPS verification study, ESK verification study, and Multi-Residential Low-Income Showerhead verification study were received through the months of April and May 2013. Appendix A includes a list of the documentation requested and provided for auditing.

This audit's scope did not include review of programs or program elements for which Enbridge did not produce reports in 2012 or in 2013 regarding 2012 program performance. Specifically, there was no auditing of the DSM measures list, DARTS, or e-Tools formulae[3]. Auditing of the market transformation program included a review of the administrative process, the associated participant paperwork documenting achievement of scorecard metrics, and Scorecard. A comprehensive review of the DSM measure list and substantiation sheets was not performed.

The core of the large C&I CPSV process began earlier than it did in previous years, allowing the auditors the opportunity to work with the CPSV firms in the execution of their work and preparation of their reports. The CPSV review included desk reviews of the Wave 1 and Wave 2 sample projects for both commercial and industrial projects. The auditors were able to provide feedback on the Wave 1 draft reports, which in turn informed the Wave 2 project execution. Regularly scheduled conference calls provided the opportunity to review the CPSV firm's progress and approach in real time. The reviews focused on appropriate baselines, cost estimates, energy savings calculations, and measure life reasonableness.

Enbridge and its contractors completed verification studies on the TAPS program, the ESK program, and on the Multi-Residential Low-Income Showerhead program. Auditors reviewed the reports for validity and comprehensiveness of analysis to ensure that they reflected OEB guidance and incorporated the most recent recommendations.

After reviewing the 2012 individual components for accuracy and compliance with Board-approved protocols, assumptions, and deemed savings values, the auditors reviewed the CCM spreadsheet for correct inputs and calculations and the three sets of calculations required to compute DSMIDA, the LRAM, and reconciliation of the DSMVA. These results were compared to the values in Enbridge's Draft Evaluation Report to confirm the proper representation of results.

Lastly, methodological recommendations were considered for individual verification activities, for administrative procedures, and in consideration of any recommended future evaluation efforts.

Audit activities continued through mid-June, with the deliverable being this Final Audit Report dated June 26, 2013.

[3] DARTS is Enbridge's program tracking database. E-Tools is Enbridge's in-house savings estimation tool that standardizes inputs and calculations for complex measures.

1.3 Report Layout

The balance of this audit report contains four main sections: Section 2 details the audited findings related to Enbridge's program research reports completed for the 2012 program year, Section 3 reports on the same for Enbridge's three financial compensation mechanisms, Section 4 presents the recommendations, and the appendices contain the previously submitted audit work plan, presentation of detailed findings associated with one of the audit's adjustment factor calculations, and a flow diagram for the CCM workbook.

2 PROGRAM AND TECHNOLOGY AUDIT

This section presents the program and technology audit findings.

2.1 Commercial, Multi-Residential, Low-Income, and Industrial Custom Program Verification

Enbridge's custom projects contributed over 86% of the portfolio's CCM of natural gas filed savings in 2012. To verify the claimed savings values, Enbridge contracted with a statistics firm to execute the sample design as described in the protocol[4] and then contracted with engineering firms to investigate the sampled projects. The samples included seventeen industrial and agricultural projects and twenty-seven commercial, large new construction, and multi-residential projects.

The audit's project-specific scope included review of inputs and outputs that could affect the CCM calculation, principally, measure annual and lifetime savings (natural gas, electricity, and water), and measure life. The project-specific reviews also included checks for the accuracy of each project's baseline definition.

The auditors' involvement in the review of the sample projects began with the receipt and review of the Wave 1[5] commercial and industrial draft CPSV reports. This early involvement allowed the auditors to examine the evaluation and reporting process that each CPSV firm intended to employ. The drafts were reviewed with their respective CPSV firms and the auditors provided feedback in the form of requests for clarification and additional data and feedback on the analysis methodology employed on each project. Auditor involvement at the early stages allowed the CPSV firms to produce final reports that reflected the input provided by the auditors.

Beyond project-specific review the audit scope associated with the CPSV work included review of the new sampling methodology and the sampling contractor's execution of it as well as review of the revised language in the TOR for the CPSV contractors, based on a recommendation provided in last year's audit. Specifically, ERS had recommended a more rigorous investigation of project performance including metering for some duration of time. The early involvement of the auditors and the increased emphasis on CPSV analytical rigor has improved the quality of the evaluation effort as reported in the 2012 Draft Evaluation Report and as evidenced by the increased variance between claimed and evaluated savings in this year's sample. Verification results that are too closely aligned with the tracking results can be a symptom of less intensive scrutiny and less independent analysis. This year's increased variability reflects an improved CPSV process. And while these improvements

[4] *Main Report: A Sampling Methodology for Custom C&I Programs*, prepared for Subcommittee of the Technical Evaluation Committee of Union Gas and Enbridge Gas Distribution by Dan Violette and Brad Rogers, Navigant Consulting, Inc., September 21, 2012.

[5] The sampled projects were broken into two waves. Wave 1 included projects that were completed in between January and September 2012; Wave 2 included projects that were completed throughout the 2012 program year.

signal a growing sophistication in Enbridge's evaluation process, there is still room for improvement, especially when verifying savings of large new construction projects.

Specific areas for improvement include revisions to administrative procedures to more accurately verify project completion dates, increased on-site metering requirements in the CPSV TOR, and alternate evaluation approach for the commercial new construction projects.

2.1.1 Project Completion Dates

One of the primary points of discussion in this year's CPSV process relates to project completion and commissioning. During the site visit, several projects were still undergoing varying levels of commissioning. This presents problems for the CPSV firms and the auditors on two fronts. First, it is difficult to assess whether or not a project should be included in a given program year if commissioning on that project continues into the following year. Firm rules do not exist on this topic and the judgment becomes subjective. Second, the verification of savings is more challenging as the observations made on-site reflect a project that is not commissioned, thereby presenting a distorted picture of achieved performance. This is particularly challenging because lifetime savings are the prime metric of concern in the new framework. While the auditor, Audit Committee, and Enbridge were able to successfully work through commissioning issues presented in this year's sample, the topic of project completion and commissioning should be reviewed with consideration to the evaluation and audit process. Without firm guidance on commissioning's role in determining project completion dates, or some form of grace period built in to allow for commissioning to be completed, this issue will come up again in future evaluation and audit cycles.

2.1.2 Enhanced Measurement and Verification Rigor

Enbridge took a significant step forward with this year's verification by including stronger data collection language in the CPSV TOR. The language, however, was not absolute and it left the decision to meter in the hands of the CPSV firms. From the TOR: "Whenever possible, the consultant will conduct field measurements where it is reasonably expected to increase the accuracy where cost-appropriate**.**" Neither of the CPSV firms deployed metering equipment at any facilities, and though spot measurements were taken in many cases, the lack of long- or short-term metering indicates that the TOR language was not strong enough. Increasing the level of on-site metering will likely result in an increase in the cost and duration of the CPSV cycle. On the industrial side, large amounts of site-specific data were typically provided by the site to the CPSV contractor, which allowed rigorous data-driven review without the deployment of logging equipment. On the commercial side, such data was largely not available from the site, and many projects could have benefited from short-term[6] metering. Although a request for additional metering was made to the commercial CPSV firm after the review of the

[6] Short-term metering in this case would be an industry standard 2 – 4 weeks, unless seasonal or production specifics required longer durations.

Wave 1 draft, additional metering was not employed on the Wave 2 sample of projects, as this was at the discretion of the CPSV contractors.

2.1.3 Alternative Approaches

The TOR also rightly requested that "alternative approaches" be used to calculate savings. This is read to mean alternative to the approach used by the applicant or by Enbridge in developing their claimed savings. Two issues were observed in relation to alternative approaches that should be considered in future evaluation and audit efforts.

First, the CPSV firms, particularly on the commercial side, often collected spot measurements that were then used to update the assumptions/inputs in Enbridge's eTools program, which is the tool used to generate Enbridge's claimed savings. The CPSV firm had Enbridge run eTools with the new post-install spot measurements and used the output as their evaluated savings. While eTools is a powerful and useful program, it should not be used by CPSV firms as a method of evaluating savings unless their engineers first validate the underlying formulae, as the CPSV effort is intended to be an independent assessment of savings. If a particular project presents a compelling reason for the CPSV firm to use eTools in their evaluation, then at a minimum the results of the eTools run should be cross-checked by the CPSV firm with an alternate methodology.

Secondly, during the CPSV process the auditors noted that post-install utility bill analysis should be employed as an alternate method to triangulate savings. This methodology could not be employed successfully on many of the commercial projects because the measures had not been in place long enough to generate any significant post-install utility bill history. Utility bill analysis is not appropriate in all cases and is often inconclusive when the savings are 10% or less of total consumption. It remains a powerful tool, however. While it cannot be employed comprehensively due to the brief period between project completion and the beginning of the evaluation/audit cycle, it may be possible to use partial-year billing data to anchor savings estimates at least for Wave 1 verification. It would be particularly valuable for the new construction projects.

2.1.4 Custom Project-Specific Findings

A number of projects in the commercial and industrial sample presented challenges to the CPSV verification firms and auditors. The details of these project-specific challenges and the auditors' opinions are below.

Industrial CPSV Projects

In the opinion of the auditor, the industrial CPSV process was carried out with care and diligence. While no short-term metering was performed directly by the CPSV contractor, the contractor was able to collect substantial data from most sites that were further supported through spot checks, utility data, and production records. Of the seventeen industrial and agricultural projects contained within the sample, the gas savings of six of the projects were revised, with two projects achieving greater levels of savings and four projects experiencing a reduction in gas savings. Typically in an evaluation, it would be unusual for 65% of the sample

projects to receive no adjustment. This is not wholly unexpected, however, as previous CPSV efforts have yielded similar results.

In the case of the industrial CPSV report, the evaluators reviewed in detail the calculations associated with these projects, verified on-site the key inputs and assumptions, and were often able to cross-check the calculations with utility consumption and production data. When the evaluators found the original calculation methodology to be sound, the key input assumptions to be supported by site data, the overall projection of savings to be well supported by in-situ data, and the evaluated estimates close to the Enbridge estimates, the contractor opted to defer to the original claimed savings values. The rationale for leaving the savings unadjusted was that minor revisions either up or down are no better supported by the data then the original savings claim.

It is preferable that the evaluators report their unique savings value for each project, even if that value aligns closely with the original savings claim as estimates based on post-installation site specific data better represent actual performance. The evaluators' choice not to adjust Enbridge's original savings claims does not indicate a lack of rigor or effort. Rather it reflects an artifact of previous CPSV cycles that should be addressed in future efforts as the sophistication and rigor of the verification process continues to improve. This is a minor issue that does not materially affect the results.

One project was subject to revision by the auditors after the CPSV results were verified and entered into the Draft Evaluation Report. This project is reviewed below.

RA.IND.EX.RT.018.12

The savings from this project come as a result of capturing waste heat from a process water chain. During the CPSV process and site visit, only 20 gpm of the intended 25 gpm of recovery flow had been connected and commissioned. Though the intent to complete the project was apparent, the CPSV firm, with the support of the auditor, opted to verify only those savings achieved as of the site visit.

In May the auditors were informed by Enbridge that the balance of the project had been completed and commissioned. Supporting statements and photos from the participant were provided in June as a means of verification of project completion. Given that CCM is the metric of concern, the auditors deemed it appropriate to reinstate the full annual savings originally claimed.

RA.IND.EX.RT.018.12	
Annual savings verified by CPSV	288,267
Annual savings reinstated by auditor	341,227
CCM savings verified by CPSV	5,765,340
CCM savings verified by auditor	**6,824,540**

Commercial CPSV Projects

The commercial CPSV sample projects presented a number of challenges related to commissioning and project completion. As noted in last year's Audit Report, the commercial new construction projects also present a challenge to the evaluation and audit firms. The

savings presented for individual projects below are annual savings. Lifetime savings (CCM) are determined by multiplying the annual savings by the measure life, which is 25 years for commercial new construction projects.

New Construction Projects

Large new commercial construction projects are difficult to verify at a moderate level of rigor. Projects do not have pre-/post- billing data for comparison, and they typically include many interactive measures and often use eQUEST or other building simulation models to project savings. In addition, designs evolve over time, equipment schedules change during commissioning, and evaluators cannot inspect within shells. Thus, evaluation tends to the extremes, either limited to verification of counts and reasonableness or employing intensive assessment via metering and remodeling of the building according to actual schedules and construction with reconciliation to post-construction bills. The latter approach often requires more than 100 hours per project.

In 2012 the CPSV sample turned out to include a number of large commercial new construction projects. Absent this knowledge in advance and without an explicit requirement to perform high rigor verification and budget accordingly, the commercial CPSV firm conducted a verification level of rigor on the new construction projects. The evaluators were provided with energy model input and output files and they performed site visits to verify installation of key components. The evaluators concluded that the models reflected the practices prescribed by the high performance new construction (HPNC) program and provided no revisions to the claimed savings. No on-site metering or post-installation utility bill analysis was performed.

The level of gas savings associated with several projects is high, with multiple projects claiming more than 75% savings.

The auditors took two approaches to reviewing the modeled savings. First and most importantly, auditors used data provided in the project files and by the evaluators in their CPSV reports to generate measure level analysis of each project to assess and verify the magnitude of claimed savings. Second, where appropriate the auditors compared the energy use intensity of the modeled base and proposed buildings to aggregate data on existing buildings in Toronto, and best-in-class performers in ASHRAE climate zone 5. Absent the intensive verification described previously, this comparative analysis provides a reasonableness test for consideration.

The modeled baseline energy use intensity (EUI) for the sampled new construction projects were compared against Natural Resources Canada (NRCan) 2010 existing building stock EUI data for similar buildings. One would expect that the sample project baselines should have markedly lower EUIs, as even a minimally code-compliant building constructed in 2012 should use less energy than the average existing building surveyed in 2010. Similarly, the modeled proposed EUI for the sampled new projects was compared with best-in-class EUI performance for high performance buildings in North American Climate Zones 5 and 6. As Enbridge's service territory is primarily located within Zone 5, the auditors believe these resources provide a reasonable basis for comparison.

These EUI comparisons are provided for a secondary level of comparison and are only provided for buildings for which the benchmark data may provide reasonable comparison. For example, EUI comparisons are provided for office buildings, as the loads and systems are fairly typical within this building sector. EUI comparison is not provided for healthcare projects, however, as their varied use and loads make the comparison difficult and potentially misleading.

While the verification firm's exercise and the auditors' subsequent measure level analysis and benchmarking comparison provide an assessment of reasonableness of the initially estimated energy savings, neither is an independent verification of project impact. Given the large savings associated with some of the new construction projects, this remains a weakness in the verification process.

One of the new construction projects claimed a substantial portion of their gas savings from fuel switching. Starting in 2012, Enbridge's performance metrics are based solely on gas savings. CCM does not inherently account for the electric penalty associated with a fuel switching measure; it just measures the gross measure gas savings. It is not an appropriate metric for fuel switching measures. The auditors recommend that the TEC establish a policy and methodology for calculating net CCM for fuel switching measures using committee-vetted assumptions.

The performance of each of the new construction projects in the sample is discussed below.

RA.PRO.NC.001.12

This project is a 471,500 square-foot office building. The modeling results indicate a 77% reduction in gas use as compared to the OBC reference building. The project's primary gas-saving features include high efficiency boilers, heat recovery on air handling units, reduced domestic hot water flow, and improved domestic hot water heater efficiency, envelope improvements, and heat recovery on the chillers. The data presented in the project file does not include a measure-by-measure summary of savings, and so the auditors' measure level results do not have a direct comparison in the file. The auditors found that the improvements in envelope performance and the use of heat recovery on the chiller and through the air handling units generated significant savings, largely in agreement with the modeled results.

RA.PRO.NC.001.12	
Measure	**Auditor Savings – m^3**
Improve boiler efficiency	109,646
AHU heat recovery	37,436
Reduce DHW flow and improve efficiency	15,090
Heat recovery chiller	164,507
Envelope improvements	121,267
Auditor savings	447,945
Claimed savings	465,065
Delta	(17,120)

EUI Comparison

The modeled baseline EUI indicates better performance than typical office buildings in Ontario. The modeled proposed EUI is greater (worse) than best-in-class office performance in Zone 5

based on research performed by the auditors[7]. It is worth noting that this building is significantly larger than any office building reviewed in the auditors' best-in-class research, and EUI values typically increase with building size.

RA.PRO.NC.001.12		
	kBtu/sf	MJ/m^2
Modeled baseline EUI	113	1,283
NRCan 2010 survey EUI	131	1,488
Modeled proposed EUI	68	772
ERS best-in-class Zone 5	16-53	182-602

The measure level analysis performed by the auditors and the review of the benchmark data suggests that the savings are reasonable. The model represents a greater level of rigor than that of the auditors' measure level analysis; therefore the auditors consider the claimed savings to be reasonable and accepted.

RA.UNIV.NC.001.12

The project model claims a gas reduction of 98% over the reference building due to numerous energy efficiency features, including the use of electrically driven geothermal heat pumps as opposed to gas-fired heating equipment. The evaluators noted during the site visit that the building had been occupied through almost an entire heating season, and no gas had been consumed by the space. The only gas consumption predicted in the model is for supplementation for heating domestic hot water.

While the program rules allow for fuel switching measures and projects to participate, a key qualifying metric is the overall reduction in greenhouse gases as a result of the fuel switch. Auditors have reviewed the baseline and proposed fuel consumption and have generated a comparison of greenhouse gas emissions for the two.

Because this project represents a fuel switch, the gas savings and emissions need to be considered from the perspective of the Province, and not from the perspective of the building owner. As such, the gas savings associated with the project are not those realized at the meter, but those realized at the source. In the base case, natural gas is consumed on-site. In the proposed case, natural gas is burned at a generating station in order to provide the electricity that powers the heat pumps. Therefore, the gas savings realized by the Province is the difference between the gas consumed on-site in the base case, and the gas consumed at a generating station in the proposed case. The proposed-case heating fuel consumption, reported in kWh, was converted to equivalent fuel consumption as if the as-built structure was heated by a steam boiler serving a heat pump water loop (this is system in the reference case). This allows

[7] *NYSERDA Deep Energy Savings Pilot: Barriers, Market Intelligence, and Recommendations*, ERS. February 28, 2012.

the GHG comparison to focus on the impact of fuel switching alone, ignoring efficiencies gained through other measures such as improved envelope performance

The source energy is calculated by taking the site energy use and applying a site-to-source conversion factor.[8]

Fuel	Site-to-Source Conversion Factor
Natural gas	1.047
Electricity	3.334

The auditors used the Tier 1 method of the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Green Gas Inventories as referenced by Environment Canada to calculate the GHG emissions associated with the source energy values calculated above for just the fuel switching measure. This method multiplies fuel consumption by a greenhouse gas emission factor that is specific to the fuel consumed and the industry sector. In both cases the fuel consumed is considered to be natural gas, as natural gas is burned on-site in the base case and off-site at a generating station in order to provide the electricity that powers the heat pumps.

	GHG Emissions (kg)
Base case	516,756
Proposed case	329,105
GHG reduction	187,651
GHG reduction	36%

Given that the project has demonstrated a 36% reduction in greenhouse gas emissions as a result of the fuel switch, it is the auditors' opinion that the project meets the requirements for eligibility.

Since there is a component of fuel switching, the total savings gas savings as realized by the Province must also be considered, and this review must consider not just the fuel switch measure, but the overall performance of the reference case and the proposed case as viewed from the source. While the conversion from site energy use to source energy use is straightforward, the assumptions used in those calculations are very difficult to quantify for a given site, and as such general values are applied. The auditors made use of site-to-source conversion factors as noted above and in the footnote below. What was found was that the net gas savings at the source level is at least what is claimed by Enbridge for the site-level savings. Both Enbridge and the auditors generated several sets of calculations, independent of one another, and in all cases arrived at the

[8] The electric site-to-source conversion factor is based on the total plan efficiency of a typical combined cycle gas turbine natural power plant brought online at the margin to generate utility electricity and includes a factor for transmission and distribution (T&D) losses. *ENERGY STAR Performance Ratings Methodology for Incorporating Source Energy Use*, ENERGY STAR, March 2011. The natural gas site-to-source conversion factor accounts for T&D losses. *ENERGY STAR Performance Ratings Methodology for Incorporating Source Energy Use*, ENERGY STAR, March 2011.

same conclusion. The auditors are confident that the claimed savings represent an accurate estimate of savings that will be achieved by the Province.

RA.UNIV.NC.004.12

Modeling results for this 190,000 square-foot academic building project indicate an 85% reduction in gas use as compared to the OBC reference building.

This project generates savings through high efficiency condensing boilers, a high performance envelope with U values 50% better than the reference building, heat recovery, and through the use of a hybrid heat pump system.

The hybrid heat pump system operates as a typical water source heat pump loop while in the cooling mode, but it operates as a fan coil in heating mode. While in heating mode, the compressors of the heat pump are not energized, the hydronic coils within the heat pumps are used to provide space heating, but the source of heat for the coils in the hot water loop served by the boilers. The hybrid heat pump system also has the ability to share or shift loads from one part of the building to another. During the shoulder seasons or mild winter days, the system has the ability to cool perimeter spaces and shift that heat to interior or core spaces that are calling for heating. This interaction is captured by the model but is difficult to replicate in an independent analysis. The auditors have estimated savings for all the measures with the exception of the heat recovery effect of the hybrid heat pump system. The difference between the auditors' measure level savings and the total project savings is due to the heat recovery feature of the hybrid system that can't be independently verified but is believed to be within a reasonable order of magnitude. Therefore the modeled savings are accepted as the final savings.

RA.UNIV.NC.004.12	
Measure	**Auditor Savings - m^3**
AHU heat recovery	42,980
Reduce DHW flow and improve efficiency	27,514
Improve boiler efficiency	77,315
Envelope improvements	138,491
Solar hot water	1,372
Heat pump savings	103,058
Auditor savings	390,729
Claimed savings	390,729
Delta	0

EUI Comparison

The modeled baseline EUI indicates better performance than typical academic buildings in Ontario. The proposed EUI value is in line with what the auditors' research suggests for best-in-class EUI values[9] for college/university classroom buildings in Zone 5.

[9] Best-in-class indicates the top 25% of performers according to ASHRAE target values. The target EUI for the top 10% of academic buildings would be 15-40.

RA.UNIV.NC.004.12		
	kBtu/sf	MJ/m^2
Modeled baseline EUI	126	1,431
NRCan 2010 survey EUI	132	1,499
Modeled proposed EUI	42	477
ERS best-in-class Zone 5 – ASHRAE Top 10%	15–45	170–511

RA.COM.NC.002.12

The modeling for this project represents only a portion of the entire facility. Out of a total of 136,000 sq ft, only 64,800 sq ft of office and meeting space was included in the model. The production areas for the facility were not included in the modeling. This adds an additional element of difficulty to the review of the project and model. The model indicates a gas use reduction of 42% in comparison to the OBC reference building.

The auditors were able to generate an estimate of savings associated with two primary measures included in the project: boiler efficiency improvements and envelope improvements.

RA.PRO.NC.001.12	
Measure	**Auditor Savings - m^3**
Improve boiler efficiency	13,318
Envelope improvements	11,519
Auditor savings	24,837
Claimed savings	24,066
Delta	771

EUI Comparison

Due to the fact that the project only covers a portion of a larger facility, EUI comparisons are not valid. The auditor measure level analysis does support the modeled savings, however, and they are accepted.

RA.HC.NC.001.12

Healthcare facilities, such as this 969,687 sq ft hospital, have significant and highly varied energy use intensities. Modeling and evaluating a facility of this size and use is very challenging. Contributing to that difficulty is the fact that the building wasn't occupied until March 2013 and will not reach full occupancy for some time, meaning any review of actual consumption data will be an effort reserved for the future.

The auditors have reviewed the modeling information and has generated measure level savings based on the information presented.

RA.HC.NC.001.12	
Measure	**Auditor Savings - m^3**
AHU heat recovery	1,275,949
Heat recovery chillers	110,000
Improve boiler efficiency	455,881
Envelope improvements	222,381
DHW savings	56,474
Auditor savings	2,120,685
Claimed savings	2,524,708
Delta	(404,023)

The CPSV firm noted that the effectiveness of two heat recovery units as observed on-site was lower than predicted in the model, but felt that this would be corrected through the ongoing commissioning process and would improve as occupancy and air flow rates increased. Further review by the auditors and Enbridge of the screen shots provided indicates that the CPSV firm referenced the wrong temperatures in their effectiveness calculations. When the heat recovery units' performance is considered with the correct temperature information as provided in the screen shots, the calculated effectiveness matches closely with that assumed in the model. No adjustment to the savings is required.

RA.REC.NC.002.12

This project was still undergoing commissioning at the time of the evaluators' site visit in 2013, although it was noted that all major systems were installed. Enbridge files note that no Verification of Installation Activity Report is on file. Additionally, the Enbridge Documentation Protocol ESC Checklist notes that as of October 2012 the project was approximately 75% complete, with the check requisition signed and dated October 2012. The project held a ribbon cutting ceremony on December 24, 2012, and it was open to the public the first week of January 2013. As the new facility was open to the public in early January 2013, it is the auditors' opinion that the project should be included in the 2012 portfolio.

The auditors have generated a measure-level analysis for this project, but that analysis does not consider one of the key gas-saving features: the use of heat recovery on the refrigeration plant that serves the ice arena and ice-making system. While significant energy savings are to be expected from this measure, the data needed to estimate the savings associated could not be gleaned from the evaluators' report or the modeling data provided in the project file. The designers anticipated that most of the space heating requirements would be met through chiller heat recovery.

RA.REC.NC.002.12	
Measure	**Auditor Savings – m^3**
DHW savings	4,096
Improve boiler efficiency	70,559
Envelope improvements	22,912
AHU heat recovery	38,518
Chiller heat recovery	Not calculated
Auditor savings	136,085
Claimed savings	275,395
Delta	(139,310)
Heat recovery chiller savings	139,310
Auditor savings	275,395

The table above demonstrates that there are savings associated with the heat recovery chiller that are not accounted for. The "missing" savings equate to a heating season load of approximately 1,700 MBH being removed from the boilers and placed on the heat recovery chillers. The heating loop that the heat recovery chillers serve has an anticipated load of approximately 1,900 MBH and its support boiler is sized as such. Since the boiler on this loop is anticipated to trim the load not met and to serve as backup to the heat provided by the heat recovery chiller, the auditors believe that the 139,310 m^3 not accounted for in the measure level analysis will be generated through the use of heat recovery on the chiller.

RA.UNIV.NC.005.12

This academic laboratory building is 48,500 sq ft and claims a gas reduction of 50%. The primary energy saving measures are glycol heat recovery loops serving exhaust and rooftop units, improved envelope performance, and improved boiler efficiency. A measure level analysis was generated by the auditors in order to verify the magnitude of savings.

RA.UNIV.NC.005.12	
Measure	**Auditor Savings – m^3**
AHU heat recovery	176,998
Improve boiler efficiency	52,337
Envelope improvements	59,814
Auditor savings	289,149
Claimed savings	302,461
Delta	(13,312)

The glycol heat recovery system is particularly beneficial due to the high fresh-air demands of the lab space. The auditors' analysis confirms that the modeled magnitude of savings is reasonable and is accepted.

Existing Facility Projects

The project files for the existing facility projects below suggest the project completion dates fall outside of the 2012 calendar year.

RA.GOV.EX.006.12

The project documentation indicates that the project was completed in September 2011. Enbridge has stated that the project completion date was June 5, 2012. The dates and documentation suggest that this project was in fact conceived and executed and underwent a post-install utility-bill analysis, which was submitted as part of the application. There is nothing in the file that documents Enbridge's involvement prior to the April 2011 submission of a post-install analysis provided by the participant. Enbridge may not have provided formal approval until 2012, thereby correctly placing the project in the 2012 portfolio. The documents suggest that this project was completed by the applicant without the influence of Enbridge, and came to Enbridge after the fact. This observation was reviewed with Enbridge staff who informed the auditors that pre-approval is always required but on a case-by-case, when the ESC has an ongoing relationship with a particular client, projects may proceed without official pre-approval. In the case of this project, the ESC was involved from project inception, providing guidance and influence, this early involvement was not well documented. Based on this input from Enbridge and the dates in the file, the project was reviewed and approved during the 2012 program year.

RA.PRO.EX.064.12

At the time of the evaluators' site visit in February 2013, the VFDs – the key pieces of equipment required to generate savings – were not installed. The evaluators have assigned zero savings to this project with the support of the auditor. The auditors received notice from Enbridge on June 5, 2013, that the work had been completed and commissioned as of May 27, 2013. The Audit Committee and the auditors have agreed that the project savings can be reinstated with a modified measure life. The measure life will be reduced by 6 months to reflect the fact that it did not come online until the end of May 2013.

Enbridge has provided a sample of data from the project's energy management system which demonstrates the operation of the VFDs. As the VFDs are able to slow the supply fan speed, the flow rate of air is reduced proportionally. The data provided shows the operating speed of the fans over 1 day of operation and as such provides a limited data set on which to base the savings. This data is of value, however, and it suggests that the savings achieved may be greater than predicted and claimed by Enbridge. The auditors accept the annual savings as claimed by Enbridge and has calculated the CCM with a measure life of 14.5 years (reduced from 15) to account for the late implementation date.

Supply Fan Speed		
	Average per Enbridge Calculations	Average per Site Data
Percent speed of supply fans	80%	78%

Adding this project's savings back into the 2012 portfolio has the effect of raising the commercial realization rate by 5.9%.

RA.PRO.EX.008.12

This project installed a heat exchanger to capture waste heat from steam condensate that was otherwise being diverted to the municipality's waste water system. The CPSV firm noted that the measure life should be reduced from 25 to 15 years to better reflect the expected life of this piece of equipment. The Board-approved custom measure life associated with heat recovery is also 15 years. When this was reviewed with Enbridge, it was noted that this simple heat exchanger was more akin to drain water heat recovery in its construction and use then to a heat exchanger whose measure life in Enbridge's estimation was meant to account for the harsh conditions experienced by a boiler economizer (a type of heat exchanger). The auditors consulted two additional resources in reviewing the measure life claims. First, the Database for Energy Efficient Resource (DEER) as maintained by the California Public Utilities Commission was reviewed. The measure life within this database for heat recovery equipment was found to be 15 years[10]. Second, the ASHRAE Owning and Operating Cost Database was reviewed. The average service life of a plate-and-frame heat exchanger was found to be 13 years[11]. Based on the Board-approved measure life for heat recovery of 15 years, the DEER-recommended measure life of 15 years, and the ASHRAE service life data, the auditors have revised the measure life associated with this measure from 25 years to 15 years.

2.1.5 Custom Statistical Weighting Adjustment

Enbridge contracted with Ipsos to calculate a sample-weighted realization rate for the commercial and industrial programs based on the CPSV findings. However, Ipsos's calculations and realization rate were not adopted to determine the adjustment factors in Enbridge's 2012 Draft Evaluation Report, likely due to miscommunication between the auditors and Enbridge on the appropriate application of these values. Instead, the 2012 Draft Evaluation Report includes adjustment factors that were calculated as the energy-weighted average of the results for only the sampled projects. This is inconsistent with the established sampling protocol[12] and the calculations performed by Ipsos, which calculated the overall commercial and industrial adjustment factors based on the weighted average of the realization rates from each strata within the verification sample. For example, the commercial savings verification sample drawn by Ipsos in accord with the established protocols dictates that 4 of the 7 largest commercial renovation projects are verified, 9 of the 61 medium-sized commercial projects be verified, and 14 of the 463 smallest commercial projects be verified[13]. The final weighted average adjustment

[10] http://www.deeresources.com/index.php?option=com_content&view=article&id=68&Itemid=60

[11] http://xp20.ashrae.org/publicdatabase/system_service_life.asp?selected_system_type=8

[12] "A Sampling Methodology for Custom C&I Program" prepared by Navigant Consulting for the Technical Evaluation Committee on September 21, 2012.

[13] The 7 projects in the largest commercial strata account for 16% of the total CCM claimed by the commercial programs, the 61 medium-sized projects account for 40% of the total CCM claimed by the commercial programs, and the 463 smallest projects account for 44% of the total CCM claimed by the commercial programs.

factor should account for the fact that the realization rates of the 4 largest projects effectively represent 15% of the savings for the commercial programs, the 9 medium-sized projects effectively represent 34% of the savings for the commercial programs, and the 14 small projects effectively represent 48% of the savings for the commercial programs[14].

The calculated commercial and industrial program adjustment factors should then be applied to the total claimed savings for all projects in the commercial and industrial sample frames to determine the verified CCM for these programs. This final step differs from the calculations in the 2012 Draft Evaluation Report, which applied hard-coded verified first-year savings to the projects that were included in the verification sample and adjustment factors to all other projects in the sample frame to determine the adjusted commercial, multi-residential, and industrial program savings. Because of the impact of weighting in the calculation of the overall realization rate, it is inaccurate to hard-code values when applying the total commercial and industrial adjustment factors to calculate savings. Instead, these adjustment factors should be applied to all projects in the sample frame to accurately determine the adjusted CCM. The impact of removing hard-coded values from the calculation is a 3,706,773 m^3 increase in CCM.

Natural gas realization rates were provided by Ipsos based on both the commercial and industrial savings verification results. Table 2-1 shows the realization rate and associated adjustment factor calculated by Ipsos and the adjustment factors utilized to calculate the resource acquisition program CCM values in Enbridge's 2012 Draft Evaluation Report.

Table 2-1. Ipsos and 2012 Draft Evaluation Report Adjustment Factors

Adjustment Factors for Commercial and Industrial Programs	Ipsos Realization Rates	Ipsos Adjustment Factor[1]	Adjustment Factor Applied in Enbridge 2012 Draft Evaluation Report
Commercial programs	85.0%	-15.0%	1.4%
Industrial programs	92.8%	-7.2%	-1.9%

[1]Adjustment factor = (Realization rate – 1)

The calculations supplied by Ipsos correctly account for the weighting between strata, and these calculations, with some corrections, should be adopted to determine the commercial and industrial adjustment factors. The auditors reviewed Ipsos's calculations and suggested two edits that resulted in updated realization rates, and subsequently, in updated adjustment factors for inclusion in the final CCM, TRC, and LRAM calculations. The adjustments made by the auditors and recommended for adoption by Enbridge and their contractor in future adjustment factor calculations were as follows.

- Ipsos drew both the commercial and industrial savings verification samples using the CCM savings provided by Enbridge. Using the CCM rather than first-year savings as the metric for sampling allows for the calculation of statistically representative CCM results

[14] Summing the percentages shown results in a value of 97% (15%+34%+48% = 97%). The remaining 3% of savings associated with the commercial projects are attributable to very small projects that were correctly excluded from the sample by Ipsos.

based not only on any CPSV recommended adjustments in first-year savings, but also on any recommended changes to measure lifetimes, which provides a more robust verification of the program performance. However, when calculating the aggregate realization rates for the two programs, Ipsos utilized first-year natural gas savings rather than CCM. To be consistent, and to ensure that the realization rates from the sampled projects are statistically representative of each program population, the realization rate calculations need to be based on CCM rather than first-year savings. The auditors have made this adjustment and recalculated the realization rates for the commercial and industrial programs. The result of this adjustment is a *small (< 2%) reduction in the commercial and industrial program realization rates.*

- Ipsos made a mathematical error in the calculation of the aggregate realization rates in which the very smallest commercial and industrial projects were incorrectly included in the weighting of the results from each commercial and industrial stratum. The auditors corrected this error and updated the aggregate realization rate results accordingly. The result of this adjustment is a *moderate (3% to 10%) increase in the commercial and industrial program realization rates.*

In addition, the following project-specific transcription error was noted in the Ipsos spreadsheet and corrected by the auditors.

- RA.PRO.NC.001.12 – The auditors noted a transcription error between the verification results and Ipsos's realization rate calculation. Ipsos's spreadsheet showed verified first year natural gas savings of 438,949 m^3 in Ipsos sheet. Based on the verification results, auditors updated this value to 438,494 m^3 and recalculated the verified project CCM. The result of this adjustment is *a small (<1%) decrease in the commercial program realization rate.*

Other project-specific adjustments were made based on the auditors' review of the commercial and industrial verification results. These adjustments are discussed above, in Section 2.1.4 of this report. In aggregate, the auditor adjustments resulted in the commercial and industrial program realization rates shown in Table 2-2.

Table 2-2. Audited Realization Rates

Adjustment Factors for Commercial and Industrial Programs	Audited Realization Rate
Commercial programs	95.6%
Industrial programs	98.1%

Appendix C details the corrected calculations in tabular format for natural gas. The change in the adjustment factor after accounting for the above adjustments is as shown in Table 2-3. The net effect of correcting the aggregate results calculation is that the custom industrial and agricultural program CCM increases by 0.03% and the custom commercial programs' CCM decreases by 5.3% compared to Enbridge's 2012 Draft Evaluation Report.

Table 2-3. Custom Sample Statistical Review-Based Adjustment Factors

Verification Report	Natural Gas Adjustment Factor
Industrial and Agriculture	
Verification report	-1.9%
Audited	-1.87%
Net difference	0.03%
Commercial and Multi-Residential	
Verification report	1.4%
Audited	-4.4%
Net difference	-5.8%

Adjustment Factors for Electric and Water Savings – The auditors also applied the calculations described above to determine the realization rates for electric and water savings associated with Enbridge's programs. In performing this calculation, the auditors noted that the uncertainty associated with these values is high, mostly because many of the projects included in the verification sample, which was drawn based on CCM, did not include electric or water savings, resulting in calculated realization rates that were not considered to be statistically significant for these two resource types. It is suspected that the large number of projects not reporting electric and water savings may be at least partially due to a decreased emphasis on calculating savings for these two resources given the shift from TRC to CCM as the target metric for benchmarking program achievement, but this is speculative and cannot be confirmed given the available information.

Electric and water savings do not directly influence the 2012 DSMIDA, DSMVA, or LRAM calculations because they do not affect the key metric of lifetime gas savings. Unlike in prior years, there is no longer computational use for a population-level adjustment factor to electricity and water savings. Electric and water savings do indirectly affect program performance in that they could affect individual project cost-effectiveness and therefore eligibility. For this reason, the CPSV firms independently verified the non-gas savings of the projects included in the sample.

The results qualitatively indicate that Enbridge is performing reasonable non-gas savings analysis for TRC input. The verification firm's variation from the reported savings was 12% or less for the sample overall (weighted by the savings of sampled projects, but not by the CCM expansion weights) for each of commercial and industrial programs' electric energy and water savings. The auditors recommend that no population-level adjustments be made to the electric or water savings based on the CPSV results.

2.1.6 Other Findings from the Custom Program Review

Auditors made other observations during custom program review that do not affect the quantitative results.

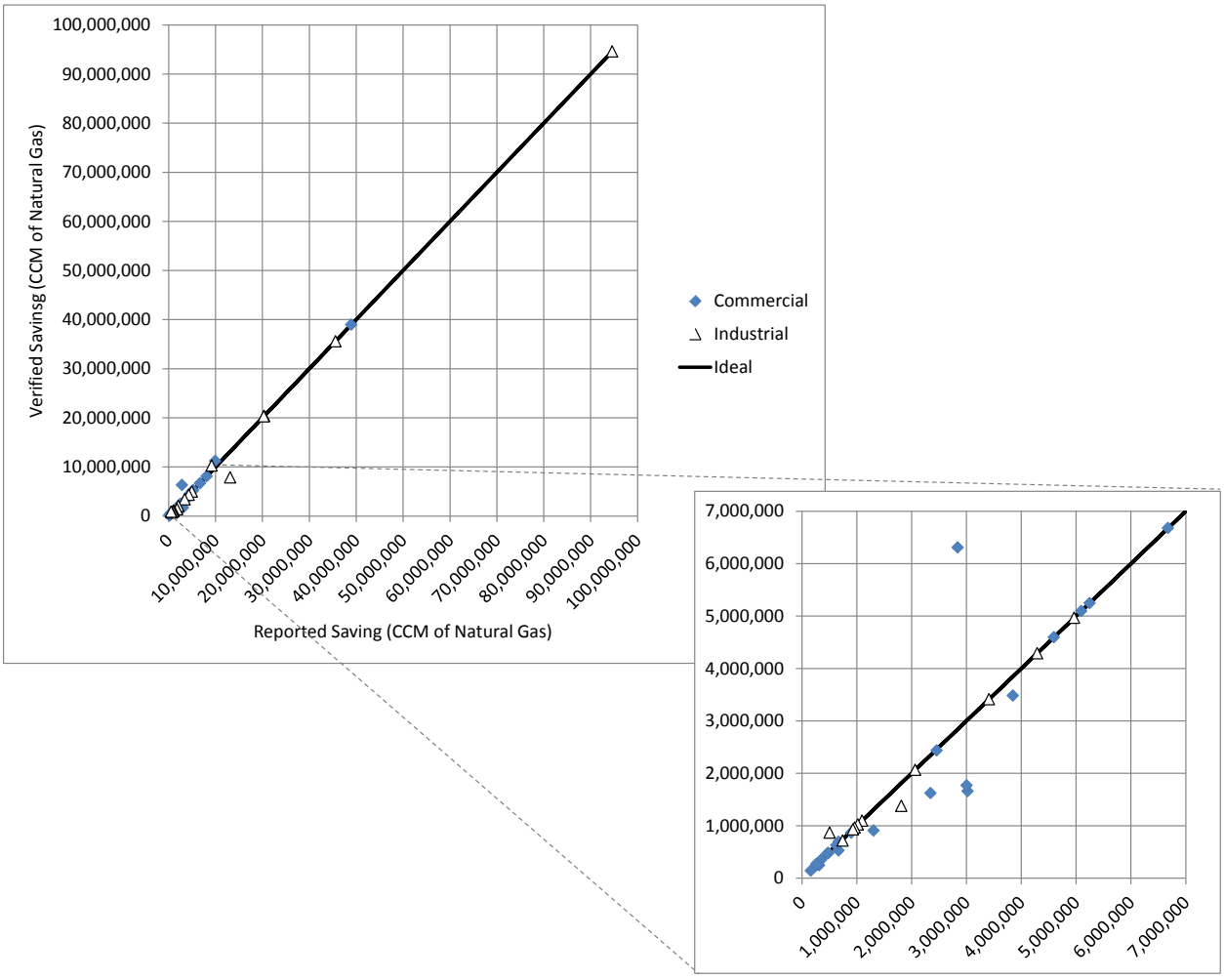
Level of rigor for M&V – Program administrators and overseers desire low variability between tracked and verified results as it typically is seen as an indication of good program savings estimation. But there can be too much of a good thing. Verification results that are too closely aligned with the tracking results can be a symptom of less intensive evaluation scrutiny and less independent analysis on the part of the CPSV firms. Quantitatively, the 2011 audit reported error ratios, which are an expression of the variability in the verification results, were calculated to be 0.05 for industrial and 0.19 for commercial and multi-residential verification.[15] For comparison, typical error ratios for custom gas programs with intensive M&V review are in the 0.3 to 1.5 range. [16]

To address this concern the AC expanded the scope of the 2012 CPSV TOR to request more independent M&V. Figure 2-1 illustrates this increase in variability as a result of the enhanced rigor. The 2012 auditor-calculated error ratios are 0.10 for industrial and 0.29 for commercial and multi-residential verification.

[15] *Independent Audit of Enbridge Gas Distribution 2011 DSM Program Results Final Report*, ERS. June 27, 2012, p. 12.

[16] *How to Design a Gas Program Impact Evaluation*, Jonathan B. Maxwell, ERS, and Kathryn Parlin, West Hill Energy & Computing, AESP National Conference, January 2011.

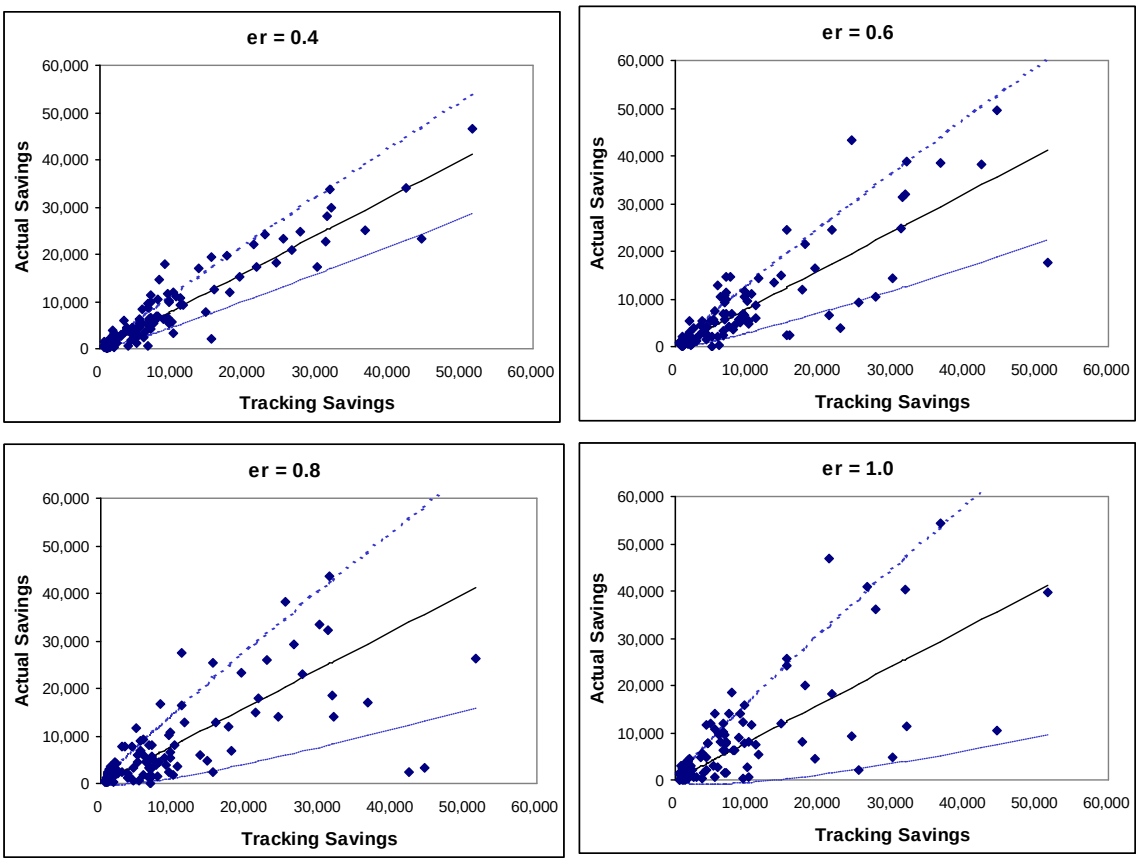
Figure 2-1. 2012 Enbridge Custom Project Correlation between Tracking and Verification Savings Estimates



For comparison, Figure 2-2, from *The California Evaluation Framework*[17], illustrates variances between reported and evaluated savings for programs with error ratios in the more typical range. As the calculations and charts show, the CPSV correlation remains high enough and the error ratio low enough to further elevate the rigor of analysis.

[17] *The California Evaluation Framework*, by the TecMarket Works team for the California Public Utilities Commission and the Project Advisory Group, June 2004.

Figure 2-2. Error Ratio as a Measure of Correlation between Tracking and Evaluated Savings



2.2 Residential Resource Acquisition

This section presents the audit findings associated with Enbridge's residential resource acquisition program, with the exception of the custom multi-residential efforts, which are included in Section 2.1.

2.2.1 Community Energy Retrofit

The Community Energy Retrofit program is new for 2012. No research reports were generated for 2012, and no prior research reports have been conducted.

Questions were raised by the AC regarding the measure life associated with the individual measures in the CER program. The program is designed to retrofit existing homes. Most measures replace equipment that reasonably can be expected to have continued at the pre-retrofit efficiency level indefinitely absent the program, but this is not the case for furnaces. The current program assumes that the savings achieved between an older existing furnace and a new high efficiency furnace will be realized for the entire 20-year measure life of the new furnace. If an existing furnace is replaced with a high efficiency unit, it is unlikely that the older unit realistically would have remained in operation for the duration of the new furnace measure life (20 years). It is more likely that the high level of savings between the old inefficient model and the new high efficiency model will be realized for some shorter period of time equal to the

remaining useful life of the existing furnace. Then, for the remaining years of the measure life, the savings are calculated as the difference between the installed high efficiency unit and a new code baseline furnace instead of the old pre-retrofit furnace. This is sometimes referred to as a "dual baseline" scenario. Estimating the duration of the initial high saving period requires knowledge of the vintage and possibly the condition of the removed units.

Introducing the dual baseline mechanism to the Enbridge savings measurement system is important for the AC and likely other TEC committees to consider now that lifetime gas savings are the key savings metric instead of first-year savings. However, the audit process is probably not the appropriate channel for introducing this principle. Auditors recommend that the TEC and Enbridge investigate the use of dual baselines or reduced measure life to account for the likely early retirement of furnaces replaced under this program, and to immediately begin collecting data on the vintages of replaced furnaces in this program.

During the review of the issue with Enbridge, they stated that the 20-year measure life was not meant to be applied to the individual measures that make up the retrofit program. They argue that the program was designed, as per the Board-approved DSM plan, to be holistic in nature and capture savings from multiple measures, and that the 20-year measure life was a blended measure life meant to reflect this multi-system holistic approach. This is understandable because programs that encourage multiple measures to achieve savings typically employ a blended measure life and do not break the savings down into individual components and measure life. For example, High Performance New Construction Projects are given a measure life of 25 years. The savings are achieved through numerous measures. Some measures, like VFDs, have a measure life of 10 years. Others, such as envelope improvements, have a measure life of 30 years or more. These projects are not broken into measure level savings and lives, however; the total savings are considered against a blended or average measure life.

At issue is the apparent lack of a deemed measure life for this program within the approved DSM plan. Enbridge argues firmly that the 20-year measure life for the program was negotiated, and savings targets were generated based on this value. This makes rational sense to the auditor, as does the premise that the program is designed to be holistic, with a blended or average measure life.

Although the concerns of the AC are well founded, and they should be considered in future program revisions, the auditors do not believe that the audit process is the appropriate venue to address what appears to be a program design issue.

Enbridge did not officially collect measure-specific data as part of the program, but information was received from participating contractors that provides insight into the type of measures most often installed and their magnitude of savings. The auditor, with input from the AC, has reviewed the data provided and has adjusted measure lives of individual measure to better align with what is considered to be typical in other DSM programs. Please note that the data represents a sample informally collected, so the totals shown below will not align with the totals attributed to the program. This sample information is used to calculate an average weighted measure life for the program, which results in a weighted average measure life of 11.1 years.

It is the auditors' opinion that the program savings should remain as claimed, as the issue is believed to be one of program design. Based on the data provided for a sample of completed projects, the auditors would recommend that the program wide measure life of 20 years be reduced in the next framework. While the data suggests a weighted average measure life of 11 years, this is based on the informal collection of data and the assumption of measure lives that have not been reviewed and approved by the Board. In the opinion of the auditor, the savings claimed by the program should not be revised due to the informal data on which the 11-year measure life calculation is based and the fact that the revision would impact Enbridge's results by less than 0.5%. The auditors recommend that additional research be conducted to determine the distribution of savings across the measures and that individual measure lives be reviewed and approved in order to generate an average measure life for the program that is transparent and substantiated.

Community Energy Retrofit Savings by Measure for a Sample of Projects					
Measure	Number of Measures Installed	Average Annual Savings – m3	Measure Life	Annual Gas Savings – all Installs – m3	Lifetime Gas Savings – all Installs – m3
Attic insulation	212	262	25	55,544	1,388,600
Basement insulation	4	800	25	3,200	80,000
Wall insulation	4	750	25	3,000	75,000
Air sealing	164	71	15	11,644	174,660
Furnace	187	755	5	141,185	705,925
DHW	17	521	5	8,857	44,285
Windows	3	808	20	2,424	48,480
DWHR	2	7	25	14	350
Totals				225,868	2,517,300
Weighted average measure life				11.1	

2.2.2 TAPS/ESK

The TAPS/ESK residential program is designed to deliver energy efficient products to residential customers. There are two avenues of delivery: the Partners Program (TAPS), where participating contractors visit households to deliver products that are self-installed, and a direct mail program (Energy Savings Kits – ESK), where kits are mailed to participants for self-installation.

Both programs provide two low-flow showerheads, one low-flow kitchen aerator, and two low-flow bathroom aerators.

A third-party evaluator completed site visits for the TAPS program and computer-assisted telephone interview (CATI) surveys for the ESK program to verify installation rates, determine the percentage of products that remained installed, and collect other data necessary to accurately report savings and evaluate program effectiveness.

A summary report prepared for each program was reviewed as part of this audit. The approach taken to the collection and reporting of data was deemed to be appropriate and the reported

results were valid, within the limits of precision stated in each report. The auditors calculated the overall weighted reduction factors for the program from the reduction factors calculated for each wave in the research report, which resulted in a slight revision to the reduction factors Enbridge presented in the CCM spreadsheet.

TAPS Calculation Review

The following table shows the results of the 2012 and 2011 TAPs verification studies. Of note is the increase in reduction factors from 2011. Reduction factors in 2011 ranged between 36%–46%.

TAPS Reduction Factors			
	2012 Total – Reduction Factors	2011 Total – Reduction Factors	Delta
Showerheads	59.3%	36.6%	22.7%
Kitchen aerators	66.8%	39.2%	27.6%
Bathroom aerators	77.5%	46.2%	31.3%

The weighted reduction factors calculated by Enbridge vary slightly from those calculated by the auditors and the source of this discrepancy is unknown. Additionally, a minor variance was observed in the total quantity of households as reported in the verification study, and the total number of households entered by Enbridge into the CCM spreadsheet. Upon review Enbridge confirmed that the value contained in the verification report was correct and that the discrepancy was the result of a data entry error. The table below illustrates the reduction factors calculated by the auditors and by Enbridge.

Weighted Reduction Factors			
	Total – Auditor Weighted Reduction Factors	EGD Total – Weighted Reduction Factors	Delta
Households	82,325	80,324	2,001
Showerheads	59.3%	60.6%	-1.3%
Kitchen aerators	66.8%	69.0%	-2.2%
Bathroom aerators	77.5%	78.1%	-0.6%

The auditor reduction factors have been used in calculating the CCM savings associated with this program. This has the effect of increasing the TAPs program CCM by 1,718,874 m^3.

Enbridge used the correct per unit savings values for each fixture as per the 2012 DSM plan substantiation documents.

ESK Calculation Review

The ESK research report was found to be appropriate and the reported results were valid, within the limits of precision stated in each report. The auditors found no exception to the approach and found that Enbridge applied the reduction factors and per unit savings values correctly in the CCM spreadsheet. While participation in the program was relatively low, only

6% who received a direct mail offer requested a kit, the reduction factors did not change considerably from 2011, as shown in the following table.

ESK Reduction Factors			
	2012 Total – Reduction Factors	2011 Total – Reduction Factors	Delta
Showerheads	44.2%	49.7%	-5.5%
Kitchen aerators	49.5%	51.0%	-1.5%
Bathroom aerators	65.3%	66.5%	-1.2%

2.3 Low Income

Enbridge's low-income portfolio includes the Low Income Residential Part 9 and Low Income Commercial Part 3 programs.

2.3.1 Low-Income Residential Part 9: Single-Family Weatherization

The review of this program consisted of a review of a project level spreadsheet, values entered into the CCM spreadsheet, and the values reflected in the Scorecard. Individual project analysis and results were not reviewed. The project level spreadsheet correctly calculated individual project CCM and correctly totaled CCM for the program. These values were entered into the CCM spreadsheet, and are accurately reflected in both the CCM spreadsheet and the Scorecard.

2.3.2 Low-Income Commercial Part 3: Multi-Residential Showerheads

Enbridge provided high efficiency showerheads to 12,267 participants in multi-residential buildings during 2012. A verification study consisting of site visits to 523 apartment units in twenty-five representative buildings was conducted by the study contractor.

The study concluded that 87.7% of the showerheads distributed under the program are still in place. This result was very consistent with the 84.5% remaining result determined in a similar survey for 2011 installation. Enbridge used this value to calculate a reduction factor of 12.3% and predict overall program savings in the CCM spreadsheet.

The auditors examined the calculations and the data collection method as described. The evaluation process and the reported savings are deemed to be reasonable and appropriate.

The auditors were informed proactively by Enbridge that the housing provider and their contractor had inadvertently installed 2.0 gpm showerheads (instead of 1.5 gpm) in 4,303 homes. This requires a revision to the deemed savings presented in the 2012 DSM plan substantiation sheets. The CCM spreadsheet presented by Enbridge contained per-unit savings for showerheads installed (1.5 gpm) and 2.0 gpm showerheads installed. Enbridge provided the substantiation documents and independent calculations (using substantiation document methodology) to support the per-unit savings values in the CCM for each low flow showerhead. The auditors found the methodology to be correct and the values and formulae in the CCM spreadsheet to be accurate.

2.3.3 Low-Income Commercial Part 3: Custom Multi-Residential Projects

During 2012, Enbridge provided avenues for low-income multi-residential sites to participate in their traditional multi-residential programs. Low-income sites that elected to participate in these programs were included in the commercial and multi-residential verification process. Therefore, the commercial CCM adjustment factor, calculated by the auditors to be -4.4%, was applied to the custom low-income multi-residential projects to determine the verified savings for this component of the low-income program. The impact of the updates to the commercial and multi-residential adjustment factor is a decrease in CCM of 1,927,431 m^3 compared to Enbridge's 2012 Draft Evaluation Report.

2.4 Market Transformation

Review of the Market Transformation programs was limited to a review of the application process, the review of all participant completed paperwork for the Savings by Design programs, a review of a sample of drain water heat recovery participant paperwork, and a review of a sample of participant paperwork for the Existing Residential Home Rating Program. For all programs, the CCM spreadsheet was reviewed for accurate data entry and formulae and for accurate representation on the Scorecards.

2.4.1 Commercial New Construction Savings by Design

The Savings by Design programs are meant to address lost opportunities in new construction by providing information and training to partnering construction or design firms. For the 2012 program year, nine firms participated in the Commercial New Construction Savings by Design program. Commitment forms, design charette agenda, and design charette summary reports were reviewed for all nine participants and were found to be in compliance with program rules. Data entry in the CCM spreadsheet was reviewed and found to be accurate.

2.4.2 Residential New Construction Savings by Design

As with the Commercial Savings by Design program, the Residential program is also meant to address lost opportunities in new construction by providing information and training to partnering construction or design firms. For the 2012 program year, twelve firms participated in the Residential New Construction Savings by Design program. Commitment forms, design charette agenda, and design charette summary reports were reviewed for all twelve participants and were found to be in compliance with program rules. Data entry in the CCM spreadsheet was reviewed and was found to be accurate.

2.4.3 Drain Water Heat Recovery

The review of the drain water heat recovery program was limited to a review of a sample of participant documentation, and a review of the CCM spreadsheet and Scorecards for accurate calculations. A review of the sample participant paperwork showed that the heat recovery drains are being tracked and recorded as per the program design. The CCM spreadsheet and Scorecard accurately calculate the savings based on the total participant data entered into the CCM spreadsheet.

2.4.4 Existing Residential Home Rating

The review of the Existing Residential Home Rating program was also limited. The program is designed to mitigate lost opportunities associated with energy retrofits around the time of resale. Participating realtors agree to provide a field for inclusion of a home's energy rating as part of the listing for the property. The commitment form reviewed by the auditors reflected a single real estate agent responsible for more than 7,000 listings per year, which represents 81% of the total number of listing claimed by Enbridge for the 2012 program year. Data entry in the CCM spreadsheet and Scorecard were reviewed and found to be accurate.

3 CALCULATIONS AUDIT

The auditors reviewed the calculation of CCM, DSMIDA, LRAM, and DSMVA in detail. In summary, no errors were found and the calculations produced the intended results. However, adjustments were made to account for the recommendations noted in the preceding sections, which resulted in auditor adjustments to the CCM, DSMIDA, and LRAM values.

3.1 Demand Side Management Incentive Deferral Account (DSMIDA) Calculations

The auditors reviewed the DSMIDA and CCM calculation methods applied in the 2012 Draft Evaluation Report and found the DSMIDA calculations to be accurate and in accordance with OEB guidelines. However, the CCM calculations required updates to accurately account for the findings of the 2012 commercial and industrial program verifications. The final CCM values were updated by auditors to reflect the changes they made in their review of the 2012 program results. The final CCM values are shown in Table 3-1.

Table 3-1. Enbridge Draft Evaluation Report and Audited CCM Values

CCM by Program Area	2012 Draft Evaluation Report CCM	Audit-Adjusted CCM	Difference in CCM = Audited CCM – 2012 Draft Evaluation Report CCM
Resource Acquisition Programs			
Residential			
ESK	2,278,932	2,278,932	0
TAPS	26,814,583	28,533,456	1,718,874
Residential Community Energy	5,296,300	5,296,300	0
Total residential	34,389,815	36,108,689	1,718,874
			Business
Commercial Prescriptive	47,373,803	47,373,803	0
Large Commercial Custom	267,146,908	251,714,332	-15,432,576
Multi Residential	236,511,341	224,606,507	-11,904,833
Large New Construction	142,482,698	134,925,548	-7,557,149
Industrial	301,537,447	305,915,406	4,377,959
Total business markets	995,052,197	964,535,597	-30,516,599
Total resource acquisition programs	**1,029,442,012**	**1,000,644,286**	**-28,797,726**
Low-Income Programs			
Residential Part 9	24,708,220	24,708,220	0

Commercial Part 3	4,933,412	43,005,980	-1,927,431
Total low income	**69,641,632**	**67,714,201**	**-1,927,431**
Total all programs	**1,099,083,644**	**1,068,358,487**	**-30,725,157**

The audited CCM result was entered into the DSMIDA calculation, and the resulting resource acquisition program DSMIDA values were updated. The audited resource acquisition, market transformation, and low-income program CCM results are shown in Table 3-2.

Table 3-2. Draft Evaluation Report and Audited Resource Acquisition, Market Transformation, and Low-Income Program DSMIDA Results

DSMIDA	2012 Draft Evaluation Report DSMIDA ($)	Audit-Adjusted DSMIDA ($)	Difference = Audited DSMIDA – 2012 Draft Evaluation Report DSMIDA ($)
2012 resource acquisition DSMIDA	$5,760,631	$5,261,430	-$499,201
2012 market transformation scorecard DSMIDA	$1,323,855	$1,323,855	$0
2012 low-income scorecard DSMIDA	$2,319,073	$2,204,632	-$114,441
Total	**$9,403,559**	**$8,789,917**	**-$613,643**

The audited DSMIDA was 6.5% less than the value reported in Enbridge's 2012 Draft Evaluation Report. The primary reasons for this deviation were the errors in the calculated commercial and industrial adjustment factors.

The auditors reviewed the CCM and DSMIDA calculations and found the method applied to calculate the DSMIDA was accurate and in accordance with OEB guidelines. The CCM calculations were found to need minor revisions and were corrected to arrive at the final audited CCM results. The resulting audited DSMIDA, with corrections to the CCM, is $8,789,917.

3.2 Demand Side Management Variance Account (DSMVA)

The DSMVA provides Ontario's utilities with operational flexibility. This account may be used to rebate unused funds to customers at the end of the program year. Similarly, the variance account provides for the recovery from ratepayers any additional costs incurred for program implementation, subject to a 15% budget cap. The variance account is essentially a true-up mechanism that has the effect of motivating utilities to pursue efficiency investments, even if their actions cause the program to exceed approved budgets, subject to a cap.

Enbridge's original 2012 Annual Plan, filed on November 4, 2011, established a 2012 DSM base budget of $28,100,000 and a total budget of $30,910,000. The latter value includes a 10% increase for low income programs. The auditors confirmed the Plan information and affirmed that the Apri 15, 2013 draft 2012 Evaluation Report cites this same information. While the draft report

states that "The initial approved budget of $30,910,000 was built into rates," subsequent documentation provided by Enbridge to the auditors, namely the December 1, 2011 Ontario Energy Board EB-2011-0277, Partial Decision and Order, notes that the parties agreed to include $28.1 million, the base not total budget amount, in Enbridge's 2012 interim rates for recovery. Enbridge's 2012 Demand Side Management Revised Annual Report, January 10, 2014, (a later version of the 2012 Evaluation Report with a different title), corrects the Plan and earlier draft report statements in noting that "As the Company's 2012 rate adjustment proceeding (EB-2011-0277) received rate making approval from the Board on December 1, 2011 which was prior to the Board's February 2, 2012 approval of the DSM Budget for 2012 with the proposed $2.81 million increase in low income spending, the base budget from the Guidelines of $28.1 million was built into rates."

Enbridge's total 2012 spending was $30,606,510. The review did not include auditing of Enbridge spending documentation. This is a financial auditor's responsibility. Auditors assumed the spending to be correct.

The auditors reviewed the calculation of the 2012 DSMVA to ensure consistency between the spending reported in the DSMVA calculation and in the 2012 resource acquisition and low-income program spending from Enbridge's financial tracking system. The auditors' review of the 2012 spending calculation showed that Enbridge overspent the base budget that was agreed upon with the Board in Enbridge's 2012 Annual Plan and built into rates. Ratepayers must reimburse Enbridge $2,506,510 via the DSMVA (see Table 3-3). Table 3-3 also shows the Aprl 15, 2013 report values for transparency.

Table 3-3. Enbridge Draft Evaluation Report, DSM Annual Report and Audited DSMVA

DSMVA	2012 Draft Evaluation Report, 4/15/2013 Value (*Incorrect*, $)	2012 DSM Revised Annual Report, 1/10/2014 Value ($)	Audited Value ($)
2012 DSM budget built into rates	$30,910,000	$28,100,000	$28,100,000
Total 2012 Enbridge DSM program spending	$30,606,510	$30,606,510	$30,606,510
2012 DSMVA	**$303,490**	**($2,506,510)**	**($2,506,510)**

3.3 Lost Revenue Adjustment Mechanism (LRAM)

The LRAM serves as a self-correcting balancing account to ensure the interests of shareholders and ratepayers are equally protected. Specifically, the adjustment mechanism is intended to compensate Enbridge for distribution margins lost as a result of greater-than-anticipated efficiency performance. Similarly, the LRAM may also be used to compensate ratepayers when the utility does not meet its volumetric DSM savings estimates. Enbridge collects DSM and other expenses through a tariff. Ratepayers fund the expenses over time based on a pre-determined rate, in dollars per m^3 of gas sales. If sales exceed forecasted amounts due to DSM

program underperformance, the consequence will be excessive ratepayer collection through the tariff. The LRAM calculation tracks any such deviation for ratepayer reimbursement.[18]

Rate adjustments for rates 1 and 6 are not included in the 2012 LRAM[19]. Enbridge's 2012 LRAM, less rates 1 and 6, is shown in Table 3-4. Negative LRAM values in the final column of this table indicate payment that is due to the ratepayer; positive values indicate LRAM that is due to Enbridge.

Table 3-4. LRAM Reported in Enbridge's 2012 Draft Evaluation Report

LRAM	Budget Net Partially Effective (m^3/yr)	Actual Net Partially Effective (m^3/yr)	Volume Variance (m^3/yr)	Distribution Margin (Cents/m^3/yr)	2012 LRAM ($)
Rate 110	1,656,894	1,578,099	-78,795	1.54	-$1,217
Rate 115	1,054,387	1,913,358	858,971	0.86	$7,363
Rate 135	0	109,885	109,885	1.32	$1,446
Rate 145	1,868,324	272,566	-1,595,759	1.79	-$28,533
Rate 170	3,898,784	550,223	-3,348,560	0.52	-$17,317
2012 LRAM	**8,478,388**	**4,424,131**	**-4,054,258**		**-$38,258**

The auditors verified that the methodologies and assumptions used to calculate the actual LRAM sales volume, net of installed efficiency measures (i.e., ex post), are consistent with the methodologies and assumptions used to calculate the year's LRAM budget sales volume (i.e., ex ante). The auditors also ensured that the net volumetric sales are appropriately allocated to each respective customer class. The auditors verified that the distribution margin and m^3 savings included in the budgeted net partially effective LRAM calculations were the same values that were applied to establish the 2012 rates. The auditors also updated the LRAM calculations to reflect the commercial and industrial adjustment factors calculated from the savings verification results. In performing this update, the auditors noted that these realization rates were calculated based on CCM rather than first-year savings. This introduces potential uncertainty to the calculation of the LRAM because the commercial and industrial

[18] "The LRAM amount is determined by calculating the difference between actual and forecast natural gas savings by customer class and monetizing those natural gas savings using the natural gas utility's Board-approved variable distribution charge appropriate to the rate class. . . . The natural gas utilities should calculate the first year impact of DSM programs on a monthly basis, based on the volumetric impact of the measures implemented in that month, multiplied by the distribution rate for each of the rate classes in which the volumetric variance occurs in. This approach will help ensure that LRAM amounts closely reflect the actual timing of the implementation of the DSM measures." From *Demand Side Management (DSM) Guidelines for Natural Gas Distributors*, EB-2008-0346, June 30, 2011, p. 33.

[19] Rate adjustments for rates 1 and 6 are not included in the 2012 LRAM. An average use true-up variance account (AUTUVA) mechanism is used in the place of LRAM for these two rates. The auditors did not review the AUTUVA; this mechanism was approved by the Board in previous rate case proceedings and was not revisited here.

realization rates are based on CCM while LRAM is predicated on first-year savings. The auditors suggest that in the future, if appropriate, the basis of the LRAM calculation be updated to CCM to be consistent with Enbridge's other reporting metrics and calculations. The audited LRAM is shown in Table 3-5.

Table 3-5. Audited LRAM Results

LRAM	Budget Net Partially Effective (m3/yr)	Actual Net Partially Effective (m3/yr)	Volume Variance (m3/yr)	Distribution Margin (Cents/m3/yr)	2012 LRAM ($)
Rate 110	1,656,894	1,453,630	-174,219	1.54	-$2,691
Rate 115	1,054,387	1,809,441	794,350	0.86	$6,809
Rate 135	0	108,382	109,479	1.32	$1,441
Rate 145	1,868,324	241,965	-1,608,087	1.79	-$28,753
Rate 170	3,898,784	488,942	-3,375,684	0.52	-$17,457
2012 LRAM	**8,478,388**	**4,102,360**	**-4,254,161**	**–**	**-40,652**

4 FINDINGS AND RECOMMENDATIONS

ERS has audited Enbridge's 2011 and 2012 reports associated with their 2012 program reporting and performance. In aggregate, the audit uncovered few elements requiring adjustment. Those adjustments collectively were small relative to Enbridge's total savings, CCM, and payment mechanism results as reported in their April 15, 2013 Draft Evaluation Report. ERS recalculated all results with audited adjustments.

Enbridge's programs are run with care and attention to detail and reflect a mature DSM program. It was noted by one CPSV firm that the participants expressed appreciation for the technical expertise and resource provided to them by Enbridge and felt they were a trusted and knowledgeable partner.

The auditors would like to thank the staff at Enbridge for their effort, cooperation, and transparency throughout the audit process. ERS would also like to extend thanks to the members of the Audit Committee for providing critical insight into the ramifications of the framework change to CCM and for their thoughtful comments and suggestions in the preparation and review of this audit report.

We have audited the Draft Evaluation Report, CCM savings, DSMIDA, LRAMVA, and DSMVA of Enbridge Gas Distribution for the calendar year ending December 31, 2012. The Draft Evaluation Report and the calculations of CCM, DSMIDA, LRAMVA, and DSMVA are the responsibility of the company's management. Our responsibility is to express an opinion on these amounts based on our audit.

We conducted our audit in accordance with the rules and principles set down by the OEB in its Decision with Reasons dated June 30, 2011, in EB-2008-0346. 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. They are also accurate in all material respects, and follow the rules and principles set down by the OEB that are applicable to the 2012 DSM programs of Enbridge:

- CCM savings – 1,068,358,487 m3
- DSMIDA amount recoverable – $8,789,917
- LRAMVA amount recoverable – $40,652 (to be paid to the ratepayers)
- DSMVA amount recoverable – $2,506,510 (to be paid by the ratepayers)

For comparison, the values previously reported by Enbridge for 2012[20] were:

- CCM savings – 1,099,083,644 m^3
- DSMIDA amount recoverable – $9,403,559
- LRAMVA amount recoverable – $38,258 (to be paid to the ratepayers)
- DSMVA amount recoverable – $2,506,510 (to be paid by the ratepayers)

In addition to quantifying the savings and recoverable amounts, auditors identified opportunities for Enbridge to enhance program operation and verification procedures in the future.

4.1 Resource Acquisition

Findings and recommendations for the Resource Acquisition Programs are below.

1. Further refine the custom verification protocols to include more intensive investigation of projects, including post-retrofit equipment performance measurement over time (on-site metering). This year's terms of reference (TOR) for CPSV contractors did include language suggesting additional on-site data collection, but more stringent language and direction on M&V activities within the TOR is needed to further improve the CPSV process.
    a. Disallow Enbridge's eTools software as a CPSV tool. Do not permit the CPSV firms to use eTools as a primary evaluation method. The issue is not eTools itself, but the lack of alternate methodology when revised eTools runs are used to verify as-built savings. If a particular project presents a compelling reason for the CPSV firm to use eTools in their evaluation, then at a minimum the results of the eTools run should be cross-checked by the CPSV firm with an alternate methodology.
    b. Request that the CPSV firms report their own savings values, even when they closely align with Enbridge's results. Though the impact to savings may be negligible, reporting the evaluator-generated savings figures lends transparency and credibility to the CPSV process.
2. Consider a separate evaluation process for large commercial new construction projects. As identified in last years' audit, the commercial new construction project savings are based on energy models generated and reviewed by third parties. This methodology is appropriate for estimating savings during the review process. Historically, the evaluation effort has been limited to a cursory review of model inputs and a site visit to verify that the proposed equipment is installed as per the design. This evaluation methodology lacks

[20] CCM and DSMIDA values are from *Demand Side Management 2012 Draft DSM Evaluation Report*, Enbridge Gas Distribution Inc., DSM Research and Evaluation, April, 2012 (DSMIDA amounts combined for resource acquisition and scorecard programs). The LRAM amount is from 2011 FE-PE_Actual vs Budget_LRAM_Audit_Step 4_May 15.xlsx, provided to ERS from Rodney Idenouye, Enbridge DSM Research and Evaluation, April 14, 2013. The DSMVA amount is from *2012 Demand Side Management Revised Annual Report, January 10, 2014*. The prior version of the annual report, the *2012 Demand Side Management Draft Evaluation Report*, April 15, 2013, reported a net payment due to ratepayers of $303,490. An accounting correction to the actual amount that was built into rates was responsible for the change to the final value.

rigor as it essentially verifies the model assumptions, but does not refine the analysis and savings to take actual performance into account. Alternate methodologies such as in-situ metering or post-install modeling reconciled to utility consumption data will provide more confidence in the evaluated and audited savings for this sector. An extended evaluation and audit cycle for these projects will need to be considered if these alternate methods are adopted, as they require the building be occupied for some period (a minimum of 6 months; ideally 18 months) so reasonable, accurate data can be collected. This may take the form of a verification independent of the normal cycle, with a one-year lag. The more intensive verification would increase the CPSV cost but should be considered in future program framework.

3. Consider research on Ontario commercial new construction standard practices for use in baseline energy use estimation**.** Multiple CPSV-verified projects claimed savings reductions in excess of 75% of the baseline with relatively conventional technologies. The CPSV firm verified and the auditors affirmed that baseline assumptions generally reflected the Ontario Building Code requirements likely in effect at the time of the construction permit application. Even so, in ERS's judgment the standards represent a low standard. Comparing the new construction sample project application baseline EUIs with average existing new building EUI data from 2010 showed less than 15% improvement, reinforcing this perception. While using code as baseline is typical practice in jurisdictions throughout North America, the low code requirements compared to likely standard practice in Ontario suggests that either Enbridge should conduct research to determine if code is a reasonable baseline representing standard practice or the program should use a net-to-gross factor that specifically accounts for the likely high free ridership compared to a code baseline.

4. Establish a policy and analysis procedure for fuel-switching projects to account for the province-level impact on net fuel use and emissions reductions. Starting in 2012, Enbridge's performance metrics are based solely on gas savings. CCM does not inherently account for the electric penalty associated with a fuel switching measure; it just measures the gross measure gas savings.

5. Provide additional clarification on the savings target increase mechanism linked to the Run *it* Right program as detailed in the Settlement Agreement. The document notes that savings targets will be revised upward if funds are "shifted" from the Run *it* Right program. There is no formal procedure through which funds are shifted; therefore, it is difficult to identify this trigger when some programs/portfolios are overspent and others are underspent.

6. Establish a future Run *it* Right verification process. Once the Run it Right program begins to generate savings, it will need to be evaluated. As the program is based on pre- and post-install utility bill analysis, the typical CPSV process may not be appropriate. The auditors recommend that the verification include a review of Enbridge's savings methodology and a desk review of a sample of projects to assess compliance with the methodology.

7. Review the administrative process associated with the Community Energy Retrofit program. Enbridge indicated that they do not collect post-retrofit measure level information on the submitted projects, but the 2012 DSM plan states that this data is to be collected on a monthly basis. Enbridge states that they are working with NRCan to provide the details required to capture individual measure savings post-retrofit.
8. Review the measure lives associated with the Community Energy Retrofit program. As discussed in Section 2.2.1, there was some discrepancy in the nature of the program between Enbridge and the Audit Committee. It must be determined if the projects are to be treated holistically with a single blended or aggregated measure life, or if each measure is to be assessed on its own, each with a unique measure life. In either case the measure life or lives should be reviewed and documented within the DSM plan.

4.2 General

General findings and recommendations are below.

1. Define what project milestone is used to determine a complete project and its completion date. Revise administrative procedures to support this new definition. Specifically, consider commissioning as it relates to project completion.
2. Correct the post-verification weighting procedure to exclude the unverified "very small" stratum from the denominator of the realization rate calculation.
3. Use the sample design contractor's sample- and energy-weighted average realization rate results in the Draft Evaluation Report and related calculations instead of the CPSV reports' energy-weighted average realization rates.
4. Require documented pre-approval for all large and/or custom incentives prior to project completion. In the course of reviewing completion dates and related paperwork of custom projects to affirm eligibility for savings, auditors learned that some custom projects do not receive pre-approval before project completion when ESC's are working closely with established participants. This was found to be the case in one of the sampled custom commercial projects. In our experience such applicants are more likely to be free riders than those that apply for incentives before or at least closer to the time of decision-making. While this particular project may just be a case of lagging paperwork, requiring pre-approval of administrative burden but has proven to be a good mechanism to reduce this type of free ridership.
5. As discussed with Enbridge and the Audit Committee, it is ERS's opinion that a TEC subsection is not necessary in the Final Annual Report as the conversations and activities of the TEC will not impact the CCM or financial mechanisms reported on in this Audit Report.

2012

DSM

AUDIT SUMMARY

REPORT

OCTOBER 14, 2013

ENBRIDGE GAS DISTRIBUTION

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Enbridge Gas Distribution
2012 DSM Audit Committee
Audit Summary Report

1.0 Introduction

In accordance with Ontario Energy Board (the Board) requirements, an independent audit was conducted on Enbridge Gas Distribution 2012 DSM program results as reported in the Company's 2012 DSM Draft Evaluation Report.

This Audit Summary Report provides a summary of:

- the process followed to audit the 2012 DSM Draft Evaluation Report of April 15, 2013;
- impact of Audit results on the 2012 DSM savings, associated Demand Side Management Variance Account (DSMVA), Demand Side Management Incentive (DSMIDA), and Lost Revenue Adjustment (LRAM) claims;
- Enbridge Gas Distribution Inc.'s (Enbridge) responses to the Auditor's recommendations;
- Enbridge's and the Audit Committee's (AC's) responses to the Auditor's recommendations.

The AC has endorsed the 2012 Audit and Enbridge's post-audit DSMIDA, LRAM, and DSMVA claims as presented in this report.

As outlined by the Ontario Energy Board in the DSM Guidelines for Natural Gas Utilities (EB-2008-0346):

"The third party Auditor, although hired by the natural gas utilities, should be independent and ultimately serve to protect the interests of ratepayers.

At a minimum the independent third party Auditor should be asked to:

- provide an audit opinion on the DSMVA, LRAM and incentive amounts proposed by the natural gas utilities and any amendment thereto;
- verify the financial results in the Draft Evaluation Report to the extent necessary to express an audit opinion;
- review the reasonableness of any input assumptions material to the provision of that audit opinion; and
- recommend any forward-looking evaluation work to be considered.

The independent third party Auditor is expected to take such actions by way of investigation, verification or otherwise as are necessary for the Auditor to form its opinion. Custom projects should be audited using the same principles as any other programs. The independent third party Auditor's work will culminate in its final audit report."

2.0 Audit Process

2.1 Selection of 2012 Audit Committee

The 2012 Audit Committee (AC) was comprised of three representatives elected from the DSM Consultative and one representative from the utility. The 2012 AC representatives are:

- Chris Neme – Energy Futures Group consultant to Green Energy Coalition (GEC)
- Judy Simon – consultant to Low Income Energy Network (LIEN)
- Vince DeRose – consultant to Canadian Manufacturers & Exporters (CME)
- Ravi Sigurdson – Enbridge Gas Distribution

2.2 Terms of Reference and Selection of Auditor

Through a consensus process, Enbridge and the AC developed the 2012 Audit Terms of Reference, conducted the competitive bidding process and selected Energy Resource Solutions Inc. (ERS) as the Auditor of the 2012 Draft Evaluation Report.

The 2012 Audit Terms of Reference described the overall objective of the audit as well as required tasks and deliverables. A copy of the Terms of Reference can be found in Appendix A.

2.3 Project Start up and Work plan

The 2012 Draft Evaluation Report was circulated to the 2012 AC and ERS on April 15, 2013 and the Consultative Members on April 17, 2013. All members of the AC provided comments on the 2012 Draft Evaluation Report.

The Auditors' Final Work Plan is attached in this report in Appendix B.

2.4 Information Exchange

Due to the Auditor being hired in January 2013, dialogue between the AC and the Auditor occurred earlier in the Audit process than in previous years. This was especially beneficial during the independent third party review of custom project savings estimates. Enbridge also continued with its open Audit process for information sharing with the AC which included the option of attending weekly meetings with the Auditor.

During audit conference calls, at least one non-utility member of the AC was required to participate in order for the meeting to proceed.

At the outset of the audit, Enbridge provided the Auditor with background materials related to the 2012 DSM activities. In addition, Enbridge arranged for the Auditor to make a site visit to the Enbridge offices in order to meet with Enbridge program managers and key technical evaluation support staff. In addition, teleconference meetings were arranged with the contractors responsible for the independent third party engineering review of custom projects. Enbridge also provided additional materials to the Auditor throughout the course of the audit including those listed below.

- Custom commercial and industrial program reports
  - 2012 Commercial Custom Projects Savings Verification Study Reports
  - 2012 Industrial Custom Projects Savings Verification Study Reports
  - 2012 Sampling workbooks completed to select projects for the program review
  - 2012 Sampling methodology guidance documents
  - 2012 Deep Savings guidance documents
- Other Research Reports
  - 2012 TAPS Verification Research Report
  - 2012 ESK Verification Research Report
  - 2012 Low Income Multi Residential Showerhead Verification
- CCM documents, records, screening tools, and calculations
  - 2012 CCM Results Workbook
  - DSMIDA calculations workbook
  - LRAM calculations workbook
  - DSMVA calculations workbook
- Enbridge's 2012 DSM Draft Evaluation Report, including comments of the AC and other stakeholders
- OEB orders and approved technical reference manuals and Enbridge filed plans
  - OEB 2008-0346: Demand Side Management Guidelines for Natural Gas Utilities
  - OEB Decision Framework
  - OEB 2006-0021: DSM Handbook
  - Enbridge DSM Plan
  - Enbridge Updated DSM Measures List (savings basis)
- Prior audit reports and recommendations
  - 2011 Audit Report
- Data tracking records and documents such as completed prescriptive forms and back-up documentation.
- Financial documents.

2.5 2012 Audit Scope of Work and Approach to Audit

The primary objective of the 2012 audit was to review the Enbridge claims for DSMIDA, LRAM, and DSMVA for the calendar year ending December 31, 2012, and to express an independent opinion on these amounts. When the Enbridge reported amounts differed from what the Auditor believed to be correct, the Auditor calculated alternative values. The audit had the secondary objective of recommending methodological changes to the program administration, input assumptions, verification, and audit processes for the future.

This year's audit process began earlier than it did in previous years. Drafting of the work plan for the 2012 audit began immediately after the kick-off meeting and was distributed to Enbridge and the Audit Committee on February 8, 2013. The first key element of the work plan was a review of the large commercial and industrial (C/I) custom project savings verification (CPSV) process. The CPSV process involves independent firms reviewing savings estimates for a sample of commercial and industrial custom projects that were selected through a prescribed sampling methodology.[1] The sampled projects were broken into two Waves. Wave 1 included projects that were completed between January and September 2012; Wave 2 included projects that were completed throughout the 2012 program year. The Auditor conducted a review of a subsample of the CPSV projects, providing feedback on adjustments to savings assumptions and other issues raised by the CPSV firms in both waves, recommending changes in the CPSV firms' approaches to Wave 2 projects and providing opinions on the reasonableness of the total savings realization rate adjustments recommended by the CPSV firms in their final reports. Regularly scheduled conference calls provided the opportunity to review the CPSV firm's progress and approach in real time. Two check-ins with the AC during the Auditor's work on the CPSV reviews also provided useful insights to the AC that had not been possible through the process in previous years.

Beyond its involvement in the CPSV reviews, the Auditor's review process included detailed walk-throughs of other Enbridge programs with an emphasis on program changes from 2011. Examination of Enbridge's DSM analysis, reporting, and tracking system (DARTS) was not in scope. The Auditor also participated in a conference call with the AC as part of the audit kickoff. Additional supporting documentation, including the Draft Evaluation Report, CCM and LRAM spreadsheets, TAPS verification study, ESK verification study, and Multi-Residential Low-Income Showerhead verification study were received through the months of April and May 2013. The Auditor reviewed all of these reports for validity and comprehensiveness of analysis to ensure that they reflected OEB guidance and incorporated the most recent recommendations. There was no auditing of the DSM measures list, DARTS, or E-Tools formulae. Although the Auditor was expected to review all aspects of Enbridge's savings estimates and flag any savings assumption that it considered potentially inaccurate or problematic, it did not conduct a detailed review of all deemed measure savings assumptions.

[1] A Sampling Methodology for Custom C&I Programs, Navigant Consulting, Inc., November 12, 2012

Auditing of the market transformation program included a review of the administrative process, the associated participant paperwork documenting achievement of scorecard metrics, and the scorecard.

After reviewing the 2012 individual components for accuracy and compliance with Board-approved protocols, assumptions, and deemed savings values, the Auditor reviewed the CCM spreadsheet for correct inputs and calculations and the three sets of calculations required to compute the DSMIDA, the LRAM, and reconciliation of the DSMVA. These results were compared to the values in Enbridge's Draft Evaluation Report to confirm the proper representation of results.

Lastly, methodological recommendations were considered for individual verification activities, for administrative procedures, and in consideration of any recommended future evaluation efforts.

2.6 2012 Audit Reports

A first draft of the ERS 2012 Draft Audit Report was circulated to the AC on June 7, 2013, with a second draft on June 14, 2013 and a third on June 21, 2013. The Final Audit Report was circulated to the AC on June 27, 2013 and filed with the Board pursuant to the Regulatory Reporting Requirements on June 28, 2013.

3.0 Results Audit

3.1 Results Summary: 2012 Recommended CCM, DSMIDA, LRAM and DSMVA

Table 1. is a summary of the figures reported by Enbridge in the 2012 DSM Draft Evaluation Report, compared to the amounts recommended by the Auditor in the Final Audit Report and finally the amounts as agreed upon by the Audit Committee.

The AC accepted the Auditor's recommended adjustments without any further modifications. However, during the documentation review process, it was identified that the Final Audit Report, filed with the board on June 28th, 2013, did not accurately update the CCM savings for an AC and Auditor approved revision. Specifically, the revised measure life for two advancement boiler projects was not incorporated into the CCM Spreadsheet. The impact was an increase of 613,643 m^3 to the CCM and $27,612 to the DSMIDA.

Table 1. CCM, DSMIDA, LRAM and DSMVA Recommendations

	2012 DSM Draft Evaluation Report[2]	Final Audit Report[3]	Post Audit Recommended Results
CCM Savings	1,099,083,644 m^3	1,068,358,487 m^3	1,068,976,932 m3
DSMIDA Amount Recoverable	$9,403,559	$8,789,917	$8,817,529
LRAM Amount Recoverable (Reimbursable to Ratepayers)	$38,358 (to be paid to the ratepayers)	$40,652 (to be paid to the ratepayers)	$40,652 (to be paid to the ratepayers)
DSMVA Amount Recoverable (Reimbursable to Ratepayers)	$303,490 (to be paid to the ratepayers)	$303,490 (to be paid to the ratepayers)	$303,490 (to be paid to the ratepayers)

The AC supports the foregoing calculations.

[2] All values from 2012 Demand Side Management Draft Evaluation Report, Enbridge Gas Distribution Inc., April 15, 2013
[3] All values from Independent Audit of 2012 DSM Program Results Final Report, ERS, June 26, 2013

3.2 CCM Results & DSMIDA Calculations

The following Table 2. from the Final Audit Report[4] is a summary of the adjustments recommended by the Auditor.

Table 2. summarizes the individual changes made that affected the calculated net annual m^3 of gas savings and the CCM. Table 3. summarizes the impact of these changes on the resource acquisition, market transformation, and low-income programs.

Table 2. Summary of Adjustments by Program Type in Final Audit Report

Description of Adjustment	Original Value	Audit Value	CCM Adjustment for DSMIDA ($)	Audit Report Ref. Page(s)
Audit Adjustments to Results of Custom Commercial, Industrial, and Multi-Residential Resource Acquisition Programs				
TAPs reduction factor % for non-installs and removals adjusted to be consistent with verification report	TAPS Showerhead 2.0 - 2.5 = 61% TAPS Showerhead 2.6+ = 61% TAPS - Bathroom Aerators = 78% TAPS - Kitchen Aerator = 69% 80,324 participants	TAPS Showerhead 2.0 - 2.5 = 59.3% TAPS Showerhead 2.6+ = 59.3% TAPS - Bathroom Aerators = 77.5% TAPS - Kitchen Aerator = 66.8% 82,325 participants	1,718,874	30
Industrial program adjustment factor	-1.9%	-1.87%	101,636	22

[4] Independent Audit of 2012 DSM Program Results Final Report, ERS, June 26, 2013.

Description of Adjustment	Original Value	Audit Value	CCM Adjustment for DSMIDA ($)	Audit Report Ref. Page(s)
Commercial and multi-residential program adjustment factor impact on commercial and multi-residential programs	+1.4%	-4.41%	-34,325,008	22
Updates to CCM calculation spreadsheet to remove hardcoding of results for sampled projects and apply adjustment factor calculated with sample weights to all projects in sample frame	995,052,197	998,758,970	3,706,773	23
Community Energy Retrofit	5,296,300	5,296,300	None	29
Commercial and Industrial deep energy savings (% of custom projects that achieved 25% savings or greater)	25%	25%	None	29
Residential deep energy savings (participants)	209	209	None	10
Resource acquisition program totals			**-28,797,726**	
Audit Adjustments to Results of Low-Income Resource Acquisition Programs				
Commercial and multi-residential program adjustment factor change impact on low-income multi-residential programs	+1.4%	-4.41%	-1,927,431	32
Low-income resource acquisition program totals			**-1,927,431**	
Audit Adjustments to Market Transformation Programs				
None	None	None	None	None
Totals, all adjustments	**–**	**–**	**-30,725,157**	

Table 3. Summary of Adjustments to CCM and DSMIDA Recommended by the Auditor

Affected Program	CCM Adjustment (m^3) Recommended by Auditor	DSMIDA Adjustment ($) Recommended by Auditor
2012 Resource Acquisition Programs	-28,797,726	-$499,201
2012 Market Transformation Programs	N/A	$0
2012 Low Income Programs	-1,927,431	-$114,441
Totals	**-30,725,157**	**-$613,643**

Table 4. below presents a detailed comparison of the CCM values reported in the Draft Evaluation Report with those provided in the Audit Report and lastly, the Final AC Adjusted values, following review of the Final Audit Report.

Table 4. Detailed Summary of CCM Values from Draft Evaluation Report, Final Audit Report and 2012 Final AC Adjusted Values

CCM (m^3) by Program Area	2012 Draft Evaluation Report	Final Audit Report	2012 Final AC Adjusted Values	Change from Final Audit Report
ESK	2,278,932	2,278,932	2,278,932	0
TAPS	26,814,583	28,533,456	28,533,456	0
Residential Community Energy	5,296,300	5,296,300	5,296,300	0
Total Residential	**34,389,815**	**36,108,689**	**36,108,689**	**0**
Commercial Prescriptive	47,373,803	47,373,803	47,373,803	0
Large Commercial Custom	267,146,908	251,714,332	251,714,332	0
Multi Residential	236,511,341	224,606,507	224,823,144	+216,637
Large New Construction	142,482,698	134,925,548	134,925,548	0

CCM (m^3) by Program Area	2012 Draft Evaluation Report	Final Audit Report	2012 Final AC Adjusted Values	Change from Final Audit Report
Industrial	301,537,447	305,915,406	305,915,406	0
Total Business Markets	995,052,197	964,535,597	964,752,233	+216,637
Total Resource Acquisition Programs	**1,029,442,012**	**1,000,644,286**	**1,000,860,922**	**+216,637**
Residential Part 9	24,708,220	24,708,220	24,708,220	0
Commercial Part 3	44,933,412	43,005,980	43,407,789	+401,809
Total Low-Income	**69,641,632**	**67,714,201**	**43,407,789**	**+401,809**
Total All Programs	**1,099,083,644**	**1,068,358,487**	**1,068,976,931**	**+618,444**

AC Response:

The AC supports the foregoing CCM calculations.

Table 5. DSMIDA Adjustment from Draft Evaluation Report to Final Audit Report to Final AC Adjusted Values

		DSMIDA results		
	Draft Evaluation Report	Final Audit Report	2012 AC Adjusted Value	Change from Final Audit Report
2012 Resource Acquisition DSMIDA	$5,760,631	$5,261,430	$5,265,185	$3,755
2012 Market Transformation Scorecard DSMIDA	$1,323,855	$1,323,855	$1,323,855	$0
2012 Low Income Scorecard DSMIDA	$2,319,073	$2,204,632	$2,228,489	$23,857
Total	**$9,403.559**	**$8,789,917**	**$8,817,529**	**$27,612**

AC Response:

The AC supports the foregoing DSMIDA calculations.

As seen in Table 3 above, the Auditor's Final Audit Report states that the Audit results produce a total DSMIDA reduction of $613,643 from the original DSMIDA amount found in the Enbridge Draft Evaluation Report.

3.3 LRAM Results

In preparing rates for a given year the forecast DSM volumes are taken into account. The Lost Revenue Adjustment Mechanism (LRAM) was established to account for the revenue impact of any variance between the forecast DSM volumes and post audit DSM volumes for the program year. LRAM only addresses the variance in DSM volumes.

In calculating the Lost Revenue Adjustment Mechanism (LRAM) for 2012, Enbridge calculated $38,258 as the amount to be returned to ratepayers. The Auditor recommended $40,652 for the 2012 LRAM as the amount to be returned to ratepayers as outlined in the Final Audit Report. The AC post-audit 2012 LRAM amount remains at ($40,652).

Table 7. below illustrates the LRAM by rate class and the variance that will need to be returned to (negative number) or collected from (positive number) ratepayers. In total ($40,652) needs to be returned to ratepayers.

Table 6. LRAM Reported in Enbridge's 2012 Draft Evaluation Report

LRAM	Budget Net Partially Effective (m^3/yr)	Actual Net Partially Effective (m^3/yr)	Volume Variance (m^3/yr)	Distribution Margin (Cents/m^3/yr)	2012 LRAM ($)
Rate 110	1,656,894	1,578,099	-78,795	1.54	-$1,217
Rate 115	1,054,387	1,913,358	858,971	0.86	$7,363
Rate 135	0	109,885	109,885	1.32	$1,446
Rate 145	1,868,324	272,566	-1,595,759	1.79	-$28,533
Rate 170	3,898,784	550,223	-3,348,560	0.52	-$17,317
2012 LRAM	**8,478,388**	**4,424,131**	**-4,054,258**		**-$38,258**

Table 7. LRAM Calculated in Final Audit Report

LRAM	Budget Net Partially Effective (m3/yr)	Actual Net Partially Effective (m3/yr)	Volume Variance (m3/yr)	Distribution Margin (Cents/m3/yr)	2012 LRAM ($)
Rate 110	1,656,894	1,453,630	-174,219	1.54	-$2,691
Rate 115	1,054,387	1,809,441	794,350	0.86	$6,809
Rate 135	0	108,382	109,479	1.32	$1,441
Rate 145	1,868,324	241,965	-1,608,087	1.79	-$28,753
Rate 170	3,898,784	488,942	-3,375,684	0.52	-$17,457
2012 LRAM	**8,478,388**	**4,102,360**	**-4,254,161**	**–**	**-$40,652**

Rate 1 and Rate 6 are not included in the LRAM amount for clearance above as these rate classes are covered under AUTUVA, Average Use True-Up Variance Account.

AUTUVA

DSM is one of several factors contributing to declining average use in Rate 1 and Rate 6. The purpose of the 2012 AUTUVA is to record ("true-up") the revenue impact, exclusive of gas costs, of the difference between the forecast of average use per customer, for general service rate classes (Rate 1 and Rate 6), embedded in the volume forecast that underpins Rates 1 and 6 and the actual weather normalized average use experienced during the year. The calculation of the volume variance between forecast average use and actual normalized average use will exclude the volumetric impact of Demand Side Management programs in that year.

The Company's rates for Rate 1 and Rate 6 are based on budgeted average volumes per customer. At the end of each year the actual average volumes are calculated from the total metered usage which includes the impact of any DSM activities. During year-end if either the audited DSM volume information or an updated estimate is not available, the budget DSM volume information, which is the best available estimate of the actual DSM volume information, will be utilized in the AUTUVA calculation. If it turns out that the current year actual audited DSM volumes are different from the budget when this information is not available for current year AUTUVA calculation, the LRAM calculation is only required for other rate classes.

AC Response:

The AC supports the foregoing LRAM calculations.

4.0 Findings & Recommendations

4.1 Auditor Recommendations with Enbridge and AC responses

Resource Acquisition:

1. Recommendation:

   Further refine the custom verification protocols to include more intensive investigation of projects, including post-retrofit equipment performance measurement over time (on-site metering). This year's terms of reference (TOR) for CPSV contractors did include language suggesting additional on-site data collection, but more stringent language and direction on M&V activities within the TOR is needed to further improve the CPSV process.

   a. Disallow Enbridge's E-Tools software as a CPSV tool. Do not permit the CPSV firms to use E-Tools as a primary evaluation method. The issue is not E-Tools itself, but the lack of alternate methodology when revised E-Tools runs are used to verify as-built savings. If a particular project presents a compelling reason for the CPSV firm to use E-Tools in their evaluation, then at a minimum, the results of the E-Tools run should be cross-checked by the CPSV firm with an alternate methodology.
   b. Request that the CPSV firms report their own savings values, even when they closely align with Enbridge's results. Though the impact to savings may be negligible, reporting the evaluator-generated savings figures lends transparency and credibility to the CPSV process.

   Enbridge Response:

   a. The CPSV firms will be instructed to come up with their own independent way of estimating savings. E-Tools should only be used as a last resort and then only if justification is provided and the CPSV firm states that it has assessed the reasonableness of the underlying formulae in E-Tools.
   b. Enbridge will bring forward the recommendation pertaining to the CPSV Terms of Reference to the TEC for review and discussion. Cost and timing are factors that must be considered in the level of post retrofit M&V required.

   Audit Committee Response:

   The AC endorses this response.

2. Recommendation:

Consider a separate evaluation process for large commercial new construction projects. As identified in last years' audit, the commercial new construction project savings are based on energy models generated and reviewed by third parties. This methodology is appropriate for estimating savings during the review process. Historically, the evaluation effort has been limited to a cursory review of model inputs and a site visit to verify that the proposed equipment is installed as per the design. This evaluation methodology lacks rigor as it essentially verifies the model assumptions, but does not refine the analysis and savings to take actual performance into account. Alternate methodologies such as in-situ metering or post-install modeling reconciled to utility consumption data will provide more confidence in the evaluated and audited savings for this sector. An extended evaluation and audit cycle for these projects will need to be considered if these alternate methods are adopted, as they require the building be occupied for some period (a minimum of 6 months; ideally 18 months) so reasonable, accurate data can be collected. This may take the form of a verification independent of the normal cycle, with a one-year lag. The more intensive verification would increase the CPSV cost but should be considered in future program framework.

Enbridge Response:

With the exception of legacy projects, all 2013 Commercial New Construction projects will be claimed via the Savings By Design Market Transformation program. It is anticipated that 2013 CCM results for legacy projects (Resource Acquisition - RA) will be substantially lower than 2012. For this reason, resources would be better utilized elsewhere than on a new evaluation approach for RA New Construction projects. However, if this should change in the future, this recommendation will be revisited.

Audit Committee Response:

The AC endorses this response.

3. Recommendation:

Consider research on Ontario commercial new construction standard practices for use in baseline energy use estimation**.** Multiple CPSV-verified projects claimed savings reductions in excess of 75% of the baseline with relatively conventional technologies. The CPSV firm verified and the Auditors affirmed that baseline assumptions generally reflected the Ontario Building Code requirements likely in effect at the time of the construction permit application. Even so, in ERS's judgment the standards represent a low standard. Comparing the new construction sample project application baseline EUIs with average existing new building EUI data from 2010 showed less than 15% improvement, reinforcing this perception. While using code as baseline is typical practice in jurisdictions throughout North America, the low code requirements compared to likely standard practice in Ontario suggests that either Enbridge should

conduct research to determine if code is a reasonable baseline representing standard practice or the program should use a net-to-gross factor that specifically accounts for the likely high free ridership compared to a code baseline.

Enbridge Response:

See response to #2

Audit Committee Response:

The AC endorses this response.

4. Recommendation:

Establish a policy and analysis procedure for fuel-switching projects to account for the province-level impact on net fuel use and emissions reductions. Starting in 2012, Enbridge's performance metrics are based solely on gas savings. CCM does not inherently account for the electric penalty associated with a fuel switching measure; it just measures the gross measure gas savings

Enbridge Response:

This Audit Recommendation will be directed to the Technical Evaluation Committee (TEC).

Audit Committee Response:

The AC endorses this response.

5. Recommendation:

Provide additional clarification on the savings target increase mechanism linked to the Run *it* Right program as detailed in the Settlement Agreement. The document notes that savings targets will be revised upward if funds are "shifted" from the Run *it* Right program. There is no formal procedure through which funds are shifted; therefore, it is difficult to identify this trigger when some programs/portfolios are overspent and others are underspent.

Enbridge Response:

The following two requirements are necessary for funds to be considered "shifted" from the RIR budget to the RA budget and the target increase trigger to occur: 1) the RIR budget is underspent; and 2) the Resource Acquisition budget (less the RIR budget) is exceeded.

Audit Committee Response:

The AC endorses this response.

6. Recommendation:

   Establish a future Run *it* Right verification process. Once the Run it Right program begins to generate savings, it will need to be evaluated. As the program is based on pre- and post-install utility bill analysis, the typical CPSV process may not be appropriate. The Auditors recommend that the verification include a review of Enbridge's savings methodology and a desk review of a sample of projects to assess compliance with the methodology.

   Enbridge Response:

   > Enbridge will direct the Auditor to conduct a desk review of a random sample of RIR projects to verify the reasonableness of the claimed savings and to ensure a yet to be agreed upon methodology (with the AC) has been followed.

   Audit Committee Response:

   > The AC endorses this response.

7. Recommendation:

   Review the administrative process associated with the Community Energy Retrofit program. Enbridge indicated that they do not collect post-retrofit measure level information on the submitted projects, but the 2012 DSM plan states that this data is to be collected on a monthly basis. Enbridge states that they are working with NRCan to provide the details required to capture individual measure savings post-retrofit.

   Enbridge Response:

   > Enbridge and the AC agree to the following: "Enbridge will continue to work with NRCan and its energy advisors to obtain individual measure savings data post-retrofit solely for the purpose of informing program design for 2015 and beyond (not to affect 2014 results – see Recommendation #8)."

   Audit Committee Response:

   > The AC endorses this response.

8. Recommendation:

   Review the measure lives associated with the Community Energy Retrofit program. As discussed in Section 2.2.1, there was some discrepancy in the nature of the program between Enbridge and the Audit Committee. It must be determined if the projects are to be treated holistically with a single blended or aggregated measure life, or if each measure is to be assessed on its own, each with a unique measure

life. In either case the measure life or lives should be reviewed and documented within the DSM plan.

Enbridge Response:

The AC accepts that Enbridge will continue to utilize a 20 year holistic measure life for the CER program in 2013, as it did in 2012. For the purpose of determining whether performance metrics have been achieved in 2014, Enbridge and the AC members agree that Enbridge will use a deemed 15 year life for all home retrofits that include furnace replacements and a deemed 25 year life for all home retrofits that do not include a furnace replacement.

Audit Committee Response:

The AC endorses this response.

General:

1. Recommendation:

Define what project milestone is used to determine a complete project and its completion date. Revise administrative procedures to support this new definition. Specifically, consider commissioning as it relates to project completion.

Enbridge Response:

Enbridge will consider a custom retrofit project complete when the equipment is purchased, installed, and turned-on by end of year and fully commissioned as intended within the next 60 days. If a project is identified as not fully commissioned during the audit process, the opportunity for resolution will be afforded until the audit is complete. Legacy new construction projects will be considered complete if Enbridge can demonstrate that efficiency measures were installed by the end of the year and the building is occupied and in use by April 30 of the following year. Legacy new construction projects not deemed completed in 2013 can be claimed in 2014 without penalty (provided they meet the definition of completion for that year).

Audit Committee Response:

The AC endorses this response.

2. Recommendation:

Correct the post-verification weighting procedure to exclude the unverified “very small” stratum from the denominator of the realization rate calculation.

Enbridge Response:

Enbridge will use the post-verification weighting procedure excluding the unverified “very small” stratum from the denominator of the realization rate calculation.

Audit Committee Response:

The AC endorses this response.

3. Recommendation:

Use the sample design contractor’s sample- and energy-weighted average realization rate results in the Draft Evaluation Report and related calculations instead of the CPSV reports’ energy-weighted average realization rates.

Enbridge Response:

Enbridge will use the sample design contractor’s sample- and energy-weighted average realization rate results in the Draft Evaluation Report and related calculations instead of the CPSV reports’ energy-weighted average realization rates. This may require that additional time be built into the CPSV process to allow for the transfer and recalculation of data.

Audit Committee Response:

The AC endorses this response.

4. Recommendation:

Require documented pre-approval for all large and/or custom incentives prior to project completion. In the course of reviewing completion dates and related paperwork of custom projects to affirm eligibility for savings, Auditors learned that some custom projects do not receive pre-approval before project completion when ESC’s are working closely with established participants. This was found to be the case in one of the sampled custom commercial projects. In our experience such applicants are more likely to be free riders than those that apply for incentives before or at least closer to the time of decision-making. While this particular project may just be a case of lagging paperwork, requiring pre-approval of administrative burden but has proven to be a good mechanism to reduce this type of free ridership.

Enbridge Response:

Enbridge will provide the required documentation to substantiate the Company's involvement for each project prior to project completion.

Audit Committee Response:

The AC endorses this response.

5. Recommendation:

As discussed with Enbridge and the Audit Committee, it is ERS's opinion that a TEC subsection is not necessary in the Final Annual Report as the conversations and activities of the TEC will not impact the CCM or financial mechanisms reported on in this Audit Report.

Enbridge Response:

Enbridge will accept ERS's opinion that a TEC subsection is not necessary in the Final Annual Report as the conversations and activities of the TEC will not impact the CCM or financial mechanisms reported on in this Audit Report.

Audit Committee Response:

The AC endorses this response.

Appendix "A"

Enbridge/Union Terms of Reference:

Independent Audit of 2012 DSM Program Results

BACKGROUND

Enbridge Gas Distribution Inc (EGD) and Union Gas Ltd (UGL) have been delivering demand side management (DSM) initiatives to their broad customer bases since 1995 and 1997 respectively. DSM activities include planning, developing, implementing and evaluating energy efficiency initiatives for residential, commercial, industrial and low income markets. The utilities' DSM activities are regulated by the Ontario Energy Board (OEB) and adhere to the requirements as laid out in the newly implemented EB-2008-0346 DSM Guidelines for Natural Gas Utilities. In response to the new guidelines, the utilities worked with intervenor stakeholder groups to develop a "Joint Terms of Reference on Stakeholder Engagement for DSM Activities by Enbridge Gas Distribution Inc and Union Gas Limited" (hereto referred to as ToR) for the new 2012-2014 Plan period. 2012 represents the first year of the new three year DSM plan period.

The OEB DSM Guidelines include three financial mechanisms: the Demand Side Management Variance Account (DSMVA), the Lost Revenue Adjustment Mechanism (LRAM), and the Shared Savings Mechanism/Performance Incentive (SSM).

Once the DSM budget has been set, the DSMVA is "…used to track the variance between actual DSM spending by rate class versus the budgeted amount included in rates by rate class. A natural gas utility may record in the DSMVA in any one year, a variance amount of no more than 15% above its DSM budget for that year. The natural gas utility should apply annually for disposition of the balance in its DSMVA, together with carrying charges, after the completion of the annual third party audit.

The actual amount of the variance versus budget targeted to each customer class will be allocated to that customer class for rate recovery purposes. If spending is less than what was built into rates, ratepayers will be reimbursed for the full amount. If more is spent than was built into rates, the natural gas utility may be reimbursed up to a maximum of 15% above its DSM budget for the year. All additional funding beyond the annual DSM budget must be utilized on incremental program expenses only (i.e. cannot be used for additional utility overheads)."[5]

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

[5] Demand Side Management Guidelines for Natural Gas Utilities EB-2008-0346, June 30, 2011, page 34, section 13.2

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

The LRAM amount is recovered in rates on the same basis as the variances in distribution revenues were experienced at the rate class level. The LRAM therefore results in a true-up rate class by rate class. The natural gas utilities should apply annually for disposition of the balance in their LRAMVA, together with carrying charges, after the completion of the annual third party audit..." [6]

The Guidelines also state that "…an incentive payment should be available to the natural gas utilities to encourage them to aggressively pursue DSM savings and recognize exemplary performance."[7] The Guidelines establish an annual cap for the 2012 incentive at $9.45M to be escalated for inflation in subsequent years. This cap was later increased by the Board to $10.45M to reflect the increased budget for the utilities' Low Income programs.

Union and Enbridge maintain systems to monitor and track DSM results. In addition, the utilities commission independent evaluations of selected DSM programs. Both utilities present detailed DSM annual reports which document program results, evaluation research and calculation of the DSMVA, LRAM, and SSM amounts. The annual reports are then subject to a third party audit. In accordance with the ToR filed with the OEB, each utility will have an Audit Committee (AC). Comprised of three intervenor representatives and a Company representative, the goal of the AC is to ensure that there is, each year, an effective and thorough audit of the utility's DSM results.

As described in the Stakeholder Engagement Terms of Reference:

- "The auditor will receive guidance and direction from the AC (e.g., on the scope of work, draft work plans, and draft work products). However, the Auditor's report and effort will be independent of utility or intervenor control or influence."[8]
- "The AC will endeavour to reach consensus on recommendations concerning the utility's claims regarding DSM annual results. Where consensus is not reached, the Committee will outline areas of disagreement in the AC's Report to the Board."[9]

The Terms of Reference also outline the process for auditor selection as follows:

"Utilities and intervenors will seek consensus on auditor selection

[6] Demand Side Management Guidelines for Natural Gas Utilities EB-2008-0346, June 30, 2011, page 35
[7] Ibid, page 31
[8] Joint Terms of Reference on Stakeholder Engagement for DSM Activities by Enbridge Gas Distribution Inc. and Union Gas Limited, November 4, 2012, page 15 of 21.
[9] Ibid, page 15 of 21.

- Where consensus on an audit firm selection from the proposals submitted is not achieved, the intervenors will decide the firm from among the proposals submitted by pre-approved bidders.
- Disputes arising from a non-consensus firm selected as the auditor will be given to the Board for consideration when the audit report is filed following completion of the audit."[10]

OBJECTIVE

The objective of the audit is to provide an independent opinion as to the reasonableness of the Company's claims regarding DSMVA, LRAM & SSM. The utilities use the audit report as evidence in their application to the Board to clear the relevant DSM accounts.

The auditor should include in their final report or subsequent memo an independent professional opinion in the following form, with or without qualifications:

We have audited the Annual Report, Performance Incentive (SSM), Lost Revenue Adjustment Mechanism (LRAM) and Demand Side Management Variance Account (DSMVA) of Enbridge Gas Distribution/Union Gas for the calendar year ended December 31, 2012. The Annual Report and the calculations of SSM, LRAM, and DSMVA are the responsibility of the company's management. Our responsibility is to express an opinion on these amounts based on our audit.

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). 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 2012 DSM programs of Enbridge Gas Distribution/Union Gas:

SSM Amount Recoverable	-	*$x,xxx,xxx*
LRAM Amount Recoverable	-	*$x,xxx,xxx*
DSMVA Amount Recoverable	-	*$xxx,xxx*

REPORTING STRUCTURE

The Auditor will be under contract with the Utilities. Pursuant to the requirements established by the Board, a group of stakeholder representatives have been elected by the DSM Consultative Group, a multi-stakeholder body, which meets from time to time to discuss and review the Company's DSM activities. These stakeholders

[10] Ibid, page 14 and 15 of 21.

representatives are called the Audit Committee "AC", the AC consists of a Company representative and three stakeholders.

2012 Enbridge Gas Distribution AC members are: Chris Neme from Energy Futures Group representing Green Energy Coalition, Vince DeRose from Borden Ladner Gevais representing CME (Canadian Manufacturers and Exporters and Judy Simon from Elenchus representing Low Income Energy Network, Judith Ramsay, Enbridge Gas Distribution.

2012 Union Gas AC members are: Julie Girvan representing the Consumers' Council of Canada, Kai Millyard from Green Communities representing the Green Energy Coalition, and Jay Shepherd from Jay Shepherd Professional Corporation representing the School Energy Coalition.

The goal of the AC is to ensure that there is, each year, an effective and thorough audit of the utility's DSM results.

As described in the Audit Committee Terms of Reference:

- "The AC will establish, as part of the 2012 audit, the standard scope of the annual audit for the term 2012 to 2014 ("goals" versus "tasks").
- The standard scope will be used for the 2012 to 2014 term as part of the RFP and the AC may alter the scope annually based on consensus. The AC will provide the auditor with input and guidance (such as scope of work, review work plan/draft report and provide advice and direction).
- The AC will make recommendations based on the Audit Report regarding the utility's claims regarding DSM results and DSMVA, LRAM, utility incentives and any target adjustments through the AC Report submitted to the Board."[11]

The AC will also help to ensure that the process enables the Company to file the Final Auditor 's Report and recommended DSMVA, LRAM and SSM claims by June 30th as required by the Board's Directive and in keeping with the Guidelines

As stated in the Audit Committee Terms of Reference: "The utility will administer the audit contract and hold the accountable to the terms of the contract."[12]
The start-up meeting with the Auditor will be held with all members of the AC to ensure a consistent understanding among all parties of the scope and expectations of the independent audit. Additional meetings between all Committee members and the Auditor will be arranged for group discussion and progress reporting. Meetings will be held at Company offices or through conference calls as appropriate.

[11] Joint Terms of Reference on Stakeholder Engagement for DSM Activities by Enbridge Gas Distribution Inc. and Union Gas Limited, November 4, 2012, page 13 of 21.

[12] Ibid, page 15 of 21.

SCOPE AND REQUIREMENTS

As stated in the Joint Terms of reference on Stakeholder Engagement for DSM Activities by Enbridge Gas Distribution and Union Gas Limited:,

"The Auditors shall, at a minimum:

- provide an audit opinion on the DSMVA, LRAM and utility performance incentive amounts proposed by the natural gas utility and any amendment thereto;
- confirm any target adjustments have been correctly calculated and applied;
- identify any input assumptions that either warrant further research or that should be updated with new best available information;
- review the reasonableness of any verification work that has been undertaken to inform utility results; and
- recommend any forward-looking evaluation work to be considered." [13]

The Auditor selected for this task will be expected to exercise his/her expert judgment to determine the elements of the audit, and to set the approach and process that will be followed in the audit in order to meet the regulatory requirements as stated above.

The deliverable will be written reports outlining the principles of the audit, the methodology followed, and the findings and recommendations of the audit, including an opinion in the form set forth above.

The following list of audit activities is suggested. It represents the minimum set of tasks the auditor will be expected to carry out. The Auditor is encouraged to propose other tasks that it believes would be helpful in reaching the ultimate goal of assessing the accuracy of Enbridge's/Union's DSMVA, LRAM, and SSM calculations.

Audit Activities

- Consider and respond to stakeholder comments on Enbridge's/Union's Annual DSM Report for 2012, including those of the Audit Committee (AC).
- Review Enbridge's/Union's 2012 procedures for tracking program participants and determine whether they lead to accurate counts, particularly for programs that do not provide customer rebates.
- Determine whether Enbridge's/Union's reported values for participation, measure lives and gas savings are appropriate for calculation of LRAM and SSM. This shall include assessing: (1) whether values are adequately documented by program records, evaluation studies and other relevant data; (2) where applicable, whether assumptions regarding measure lives and gas savings are in line with Board/TEC (Technical Audit Committee) approved values for calculation of the SSM; and (3) the reasonableness of measure

[13] Ibid, page 17 of 21.

lives and savings for the calculation of LRAM and SSM.

- Review measures that are considered advancements rather than replacements to ensure measure lives and gas savings are treated appropriately. As part of such consideration of advancement measures the auditor shall assess both whether gas savings and measures lives are estimated in line with models developed in the last 2 years and whether such models are reasonable.
- Review and verify the accuracy of all calculations leading up to the proposed DSMVA, LRAM, and SSM amounts and verify that the calculations are consistent with the Board-approved prescribed methodology.
- Verify that the methodology and assumptions used to calculate the "actual" LRAM volume savings are consistent with the methodology and assumptions used to calculate the LRAM budget volume savings and identify and quantify any inconsistencies.
- Verify the calculation of the Market Transformation incentive. As part of such efforts, the auditor should provide an opinion on the accuracy of EGD's /Union's reporting of performance against program metrics and the reasonableness of EGD's/Union's interpretation of program metric results. The auditor shall also provide an opinion as to the usefulness of Enbridge's market transformation metrics as indicators of success in market transformation and, where applicable, propose alternatives that may be better indicators to use in the future.
- In accordance with OEB direction, Enbridge/Union, in consultation with their respective Audit Committees have retained independent third party engineering consultants to undertake a detailed review of the savings estimates for Industrial and Commercial custom projects. To ensure that the auditor may rely on the reports of the third party engineering firms in giving the auditor's opinion on the reasonableness of the utility's claims re: DSMVA, LRAM and SSM, the Audit Committees have made provision for the auditor to work with the selected firm to ensure reliance on the draft and final reports by discussing individual projects, any findings and adjustment factors recommended throughout the firm's review. The auditor will also give their opinion as to the quality of their review and the consultant's adherence to the terms of reference and the reliability and reasonableness of the error ratio (and/or realization rate) when applied to a larger population of custom projects..
- The auditor will also review other studies conducted in support of the DSM Annual Report.
- Identify any assumptions underlying Enbridge's/Union's DSM program design that should be modified prospectively, based on the auditor's experience, the results of the audit, and knowledge of other studies or data.
- Identify future evaluation work opportunities to enhance the assumptions used to calculate the SSM and LRAM.
- Work with the AC and Enbridge/Union to resolve any relevant issues prior to completion of the audit.

- Any other matters considered by the auditor to be relevant to an assessment of Enbridge's DSMVA, LRAM and SSM claims.

Audit Resources

To assist the Auditor in conducting the audit, all relevant Company documentation will be made available to the Auditor for review. The Company is committed to providing the necessary data and tools the Auditor deems reasonably necessary in order to meet the ultimate goal of the audit. The list below provides examples of the resources that can be made available to the Auditor, but the list should not be considered as necessarily complete or exhaustive:

- Access to the Company's program tracking system and documentation of program participants;
- Access to the Company's cost-effectiveness screening spreadsheet tool;
- Access to all regulatory decisions and agreements which outline the requirements for DSM evaluation and the independent audit;
- Access to all regulatory decisions and guidelines that outline the DSMVA, LRAM and SSM calculations and procedures;
- Access to comments provided by DSM Consultative members on the 2012 DSM Annual Report;
- Access to all relevant evaluation and market research conducted by the Company relating to or informing the results for 2012 including a third party engineering review of a sample of custom projects in business markets, and including any research carried out after 2012, whether final or in draft form;
- Access to all previous audit reports;
- Enbridge's/Union's DSM and Program Evaluation department staff time; and
- Communication as required by the Auditor with the AC.

SCHEDULE

Following the Board Directive of December 2004, the independent audit of DSM results is to be completed and a recommendation filed with the Board by the last day of the sixth month after the financial year end.

Due to the importance to meet these Board imposed deadlines, the Auditor will be contractually bound to meet the deadlines outlined in their proposal. If due to the Auditor's negligence, the Auditor has not provided Enbridge with the deliverables, Enbridge may, in its sole discretion and after consulting with the EAC, deduct 10% of the amount payable to the Auditor for each week beyond the deliverable dates specified herein that the Auditor has not provided Enbridge with the deliverables. The schedule below meets this requirement.

Audit Schedule	
Activity	**Due**
RFP Dissemination	December 3, 2012
Questions of Clarification	December 7, 2012
Proposals Due	December 17, 2012 – 4:00 PM E.S.T.
Contract Awarded	January 7, 2013
Auditor Work Plan	Week of January 21, 2013
Launch Meeting	Week of January 21, 2013
Wave 1CPSV Draft Reports Wave 2 CPSV Draft Reports	Week of January 7, 2013 Week of March 18, 2013
CPSV Final Reports	Week of April 1, 2013
DSM Annual Report sent to Auditor	April 12, 2013
AC & Consultative Comments on Annual Report	April 24, 2013
Draft Audit Report	On or before June 7, 2013
Response from AC	On or before June 14, 2013
Final Draft Audit Report	On or before June 19, 2013
Final Audit Report	On or before June 24, 2013

CRITERIA

Proposals will be evaluated on the following criteria:

- Experience and qualifications of the firm: direct experience in evaluation or audit of utility DSM programs,
- Methodology proposed,
- Demonstrated understanding of Enbridge / Union rules and requirements,
- Proposed schedule and ability to meet timelines, and
- Price proposal.

PROPOSAL REQUIREMENTS

Please disclose any potential conflicts of interest.

The proposal should include the following elements:

- A description of the methodology and approach to be used in the audit,
- A list of proposed tasks,
- Suitable information for Enbridge/Union to determine the qualifications of individuals and their roles in the project,

- Confirmation that the proponent will be able to meet the Enbridge/Union contractor insurance and WSIB requirements as described in the attachment, and
- Confirmation of ability to meet timelines or specific reasons why a deviation from the schedule is required.

The cost proposal should include:

- Breakout of costs by task and roles,
- Assumptions regarding the number of meetings at the Enbridge/Union offices and the associated costs, and
- Hourly rates for additional related work such as appearing as an expert witness at the OEB.

Proposals are due no later than 4:00 pm on December 17, 2012. Proposals may be submitted in hard copy or via email.

Questions of clarification should be directed to Rodney Idenouye at the coordinates indicated below. Responses to questions of clarification will be circulated to all respondents.

All correspondence should be sent to the attention of:

Rodney Idenouye, DSM Research and Evaluation
Phone: 416-495-6603 Email: rodney.idenouye@enbridge.com

Enbridge contract requirements regarding Insurance and WSIB

Insurance

Save and except where Enbridge specifies otherwise in writing, the Consultant shall at its own expense maintain and keep in full force and effect during the Term hereof and for a period of two (2) years following the expiry of the Term or other termination of this Agreement:

(a) worker's compensation insurance as required under applicable laws;

(b) commercial general liability insurance having a minimum inclusive coverage limit, including personal injury and property damage, of at least Two Million Dollars ($2,000,000). Enbridge must be added as an additional named insured in the insurance policy, which should be extended to cover contractual liability, products/completed operations liability, owners'/ contractors' protective liability and must also contain a cross liability clause;

(c) automobile liability insurance on all vehicles used in connection with this Agreement and such insurance shall have a limit of at least Two Million Dollars ($2,000,000) in respect of bodily injury (including passenger hazard) and property damage inclusive of any one accident;

(d) non-owned automobile liability insurance and such insurance shall have a limit of at least Two Million Dollars ($2,000,000) in respect of bodily injury (including passenger hazard) and property damage, inclusive in any one accident;

(e) professional liability or errors and omissions insurance and such insurance shall have a limit of at least Two Million Dollars ($2,000,000); and

(f) such other insurance as Enbridge may in its discretion determine to be necessary.

WSIB

The Consultant agrees to comply with the Occupational Health and Safety Act (Ontario) and the Workplace Safety and Insurance Act (Ontario) and with all other prevailing federal, provincial and municipal laws and regulations or any other laws or regulations in force in any jurisdiction where the consulting services are performed (the "Laws") and which are applicable to the Consultant, its subcontractors and the consulting services provided hereunder, and the Consultant shall familiarize itself and procure all required permits and licenses and pay all charges and fees necessary or incidental to the due and lawful prosecution of this Agreement and shall indemnify and save harmless Enbridge, its directors, officers, agents and employees thereof against any claim or liability from or based on the violation of any Laws, whether by the Consultant, its officers, employees, subcontractors, representatives or agents

APPENDIX B

Audit Final Work Plan

Independent Audit of Enbridge Gas Distribution 2012 DSM Program Results

Final Work Plan

energy & resource solutions

120 Water Street, Suite 350
North Andover, MA 01845
978-521-2550
January 29, 2013

INTRODUCTION AND OBJECTIVES

Enbridge Gas Distribution (Enbridge) operates a series of demand side management (DSM) programs to encourage customers to use less natural gas and, in some cases, less electricity and water. The company receives a combination of direct cost recovery and performance-based payments associated with program delivery. The Ontario Energy Board (OEB) and the consultative group's Audit Committee (AC) require independent third-party review of Enbridge's annual report and supporting calculations to ensure that savings claims and performance-based payment calculations are correct.

The primary objective of this audit is to review the Enbridge Gas Distribution calculations for Cumulative Cubic Meters (CCM) savings, the Demand Site Management Incentive Deferral Account (DSMIDA), the Lost Revenue Adjustment Mechanism Variance Account (LRAMVA), and the Demand Side Management Variance Account (DSMVA) for the calendar year ended December 31, 2012, and to express an independent opinion on these amounts. Enbridge has contracted with Energy & Resource Solutions (ERS) to be the auditor. If the Enbridge-reported amounts differ from what ERS believes to be correct, ERS will present alternative values. As noted in the OEB DSM Framework, the auditor has a secondary role to recommend any forward-looking evaluation work for consideration.

This audit will be conducted in accordance with the rules and principles set down by the Ontario Energy Board in its Decision with Reasons dated June 30, 2011, in EB-2008-0346 and as described in the *Joint Terms of Reference on Stakeholder Engagement for DSM Activities*, by Enbridge Gas Distribution, Inc., and Union Gas Limited, November 4, 2011, as filed with the Enbridge DSM Plan, Exhibit B Tab 2 Schedule 9, 2011-11-04, EB-2011-0295.

ERS will perform the audit according to the tasks described in this work plan.

TASK 1: PLANNING AND MEETINGS

ERS will gather information during Task 1.4 – Launch Meeting and will continue to assemble documentation throughout the first month of the audit as part of Task 2. ERS already has received the following material:

Year-end custom commercial and industrial program reports

- 2012 Custom Commercial Verification Wave I Draft Report
- 2012 Custom Commercial Verification Wave II Report and Final Report (Final Report includes Wave 1 and Wave 2)
- 2012 Custom Industrial Verification Wave I Draft Report
- 2012 Custom Industrial Verification Wave II Report and Final Report(Final Report includes Wave 1 and Wave 2)
- 2012 Custom Commercial and Industrial sample project files
- 2012 sampling workbooks completed to select projects for the Wave I and Wave II custom verification reviews

2012 sampling methodology guidance documents

2012 Year-end residential program reports and information

2012 TAPS program verification study

2012 ESK program verification study

2012 Low Income Weatherization Program. Project level reconciliation spreadsheet.

2012 Community Energy Retrofit Program narrative

2012 Low-Income Year-End Program

- 2012 Multi-Residential Low Income Showerhead program verification study
- Spreadsheet calculations and supporting documentation to substantiate the per unit savings values

2012 Market Transformation Programs

- 2012 Commercial Savings by Design, all commitment forms, Charette agenda, and Charette Summary Reports
- 2012 Residential Savings by Design, all commitment forms, Charette agenda, and Charette Summary Reports
- 2012 Residential Home Labeling Program, a sample of realtor commitment
- 2012 Drain Water Heat Recovery Program, a sample of participant enrollment and tracking paperwork
- A narrative detailing the participant review and approval process for Market Transformation programs

CCM documents, records, screening tools, and calculations

2012 CCM Results DSMIDA Workbook(s)

2012 CCM plan

LRAMVA calculations workbook

Enbridge's DSM Annual Report for 2012, including comments of the AC and other stakeholders

OEB orders and approved technical reference manuals and Enbridge-filed plans

OEB 2008-0346: Demand Side Management Guidelines for Natural Gas Utilities

OEB Decision Framework

EGDI DSM Plan for 2012–2014

EGDI Low-Income DSM Plan

EGDI Updated DSM Measures List (savings basis)

Task 1.1 is primarily a survey and data collection exercise. ERS will review the orders and plans for policy purposes. An in-depth review of the 2012 program and research reports is part of Task 2.

Weekly Meetings

ERS will attend, via teleconference, weekly or bi-weekly meetings to discuss progress and issues and to request additional information as necessary. This will also allow ERS a forum to share preliminary findings early in the audit cycle. This will give the AC, Enbridge, and the program administrators the opportunity to provide more data, clarify issues, or correct auditor perceptions, which will in general result in the most accurate and useful recommendations at project end.

ERS will recommend agenda items as they pertain to the audit and will issue meeting notes or action items following each meeting.

Work Plan

ERS will prepare draft and final work plans to guide efforts during the project. The work plan will be based primarily on three sources: (1) the proposal, (2) last year's work plan, and (3) information collected during the first 2 weeks of meetings and file receipt.

Launch Meeting

ERS and Enbridge held a launch meeting at Enbridge's office January 23–24, 2013. During the meeting, ERS met with Enbridge staff and the custom commercial and industrial evaluation firms, and had a conference call with the AC. The purpose of these meetings was to review information and materials collected to date, solicit additional input, identify key issues, review internal Enbridge processes, provide feedback on the Wave I commercial and industrial custom program savings verification (CPSV) reports, and discuss any uncertainties that may affect the audit. Following the launch meeting, ERS prepared and issued a request for documentation and action items from the commercial and industrial CPSV meetings.

TASK 2: RESEARCH

In Task 2, ERS will conduct the majority of research and analysis associated with this year's audit effort. The research and analysis will include the review of tracking systems, annual reports and verification studies, DSM Shareholder Incentive data and calculations, and CPSV evaluation efforts.

Consider Stakeholder Comments to Annual Report

ERS will review and respond to stakeholder comments on Enbridge Gas Distribution's Annual DSM Report for 2012, including those of the AC. Work associated with this task is likely to be concentrated in the second half of the audit period, as the annual report will be issued in the spring, and then comments will follow, and auditor consideration must then follow that. The deliverable associated with this activity will be a memorandum.

Review Tracking Systems

ERS reviewed Enbridge's key program-specific tracking systems in person with Enbridge managers in conjunction with the launch meeting. We will review tracking procedures to determine if the DARTS results that are the basis of the scorecards are being properly entered into Enbridge's management information systems, the CCM, and the DSMIDA calculation workbook. ERS will audit the flow of information through the system. ERS will modify the flowchart created for last year's audit report, which illustrates the process.

ERS will test the aggregating system to determine whether the stored data is accurate. Our data system review will include the following activities on a significant sample of project records:

Validation of data inputs

Verification of storage and back-up protocols

Review of quality assurance and quality control protocols

Review of exception-handling mechanisms

Review of user documentation

Audit of DARTS is not in the scope.

Determine Verity of Inputs for LRAM and DSM Shareholder Incentive Calculations

Enbridge's CCM workbook review will provide the information necessary to audit the annual report savings and the DSMVA calculation. Enbridge performs LRAM and DSMVA incentive calculations separately. ERS will audit both sets of calculations to determine if Enbridge:

Adequately documents values

Uses assumptions regarding savings and life in line with board/Technical Evaluation Committee (TEC) approved values

Uses reasonable and correct savings calculations for the LRAM and DSM Shareholder Incentive

ERS generally will audit for compliance with TEC-adopted prescriptive savings assumptions unless exceptional material problems require adjustments to give an opinion.

Review Advancement Measures

In this task ERS will review measures that are considered advancements rather than replacements to ensure that measure lives and gas savings are treated appropriately. As part of such consideration of advancement measures the Auditor shall assess whether gas savings and measures' lives are estimated in line with models developed in the last 2 years and whether such models are reasonable.

Review DSMVA, LRAM, and DSMIDA Calculations

ERS shall review and verify that all calculations associated with the DSMVA, LRAM, and DSM Shareholder Incentive amounts are consistent with the board-approved prescribed methodology.

Review and Provide an Opinion on Custom Project Quality and Adherence to Terms of Reference

We will perform comprehensive reviews of independent third-party engineering savings estimates of industrial and commercial customer projects and provide documented findings regarding quality and accuracy.

The earlier start to the 2013 audit of 2012 performance will enable ERS to work with the third-party engineering firms and discuss individual projects with them concurrently rather than just audit them ex post. The review will include consideration of the verification firms' aggregate findings and adjustment factors and the draft and final reports. In addition to working directly with the engineering firm(s), our overall conclusions regarding the reliability of the reported project performances will be built upon the following:

File review – Our team will perform a thorough review of the project files and third-party reviews for the custom projects. For this review we will utilize a checklist, allowing us to systematically determine whether key project elements have been reported and are well documented. Any data, assumptions, or calculations considered less than reliable will be recorded for follow-up.

Advancement/replacement and other baseline characterization – For this audit, we will rely on our collective experience to validate Enbridge's claimed custom project savings. Following this review, our staff will be in a position to discern whether tracked custom project savings were either over- or under-stated. Should we discover any deviations from OEB-approved or industry-accepted methodologies, we will recommend appropriate revisions and recalculate the DSMIDA based on adjusted CCM metric values. Also, we will make any relevant recommendation to Enbridge's processes so that future DSMIDA adjustments will be unnecessary. We will also provide assistance for future evaluations by recommending methodologies that can improve the net benefits of custom projects.

Reported data revision – Our experience with project review informs us that there will be times when a common understanding of project performance will not be met. When this occurs, we will include a recommendation for revised project assumptions or calculations, comparing this with what were originally reported, and we will provide reasons for the recommended changes.

Other document review – All other relevant information related to industrial and commercial custom projects that have been completed in support of the Enbridge DSM Annual Report will be reviewed and utilized in making final recommendations.

At the conclusion of our custom projects examination, our team will report findings, issue opinions, and make recommendations regarding Enbridge's custom program initiatives.

Review Verification Studies

ERS will review the verification studies that are associated with the DSM Annual Report. This review will verify that the conclusions of the verification studies are sound and that the results have been properly incorporated into the calculation of the DSM Shareholder Incentive.

TASK 3: FINDINGS AND REPORTING

In Task 3, ERS will identify the findings of the audit effort and prepare the final report for distribution to Enbridge and the AC.

Identify DSM Program Design Assumptions to Modify Prospectively

ERS will identify any assumptions underlying Enbridge's DSM program design that should be modified prospectively, based on the auditor's experience, the results of the audit, and knowledge of other studies or data.

Identify Future Evaluation Research Opportunities

ERS will identify future evaluation research opportunities to enhance the assumptions used to calculate the DSMIDA and LRAM.

Provide Opinion on Usefulness of Market Transformation Metrics as Indicators of Success

ERS will provide an opinion as to the usefulness of Enbridge's market transformation (MT) metrics as indicators of success in market transformation and, where applicable, propose alternatives that may be better indicators to use in the future.

Resolve Issues Prior to Audit Completion

Through the weekly meetings and regular updates, ERS will work with AC members to resolve any relevant issues prior to audit completion.

Identify other Matters Relevant to Assessment Claims

As stated in the RFP, ERS will identify any other matters considered to be relevant to an assessment of Enbridge's DSMVA, LRAM, and DSMIDA.

Final Report

Upon completion of the above tasks, ERS will be able either to render the independent opinion that the CCM, DSMIDA, LRAMVA, and DSMVA calculations and results are correct and reasonable as submitted in Enbridge's annual report, or to provide independently developed alternative calculations of the same. The final report will include the following statements:

> We have audited the Annual Report, Cumulative Cubic Meters (CCM) savings, DSM Incentive Deferral Account (DSMIDA), Lost Revenue Adjustment Mechanism Variance Account (LRAMVA), and Demand Side Management Variance Account (DSMVA) of Enbridge Gas Distribution for the calendar year ended December 31, 2012. The Annual Report and the calculations of CCM, DSMIDA, LRAMVA, and DSMVA are the responsibility of the company's management. Our responsibility is to express an opinion on these amounts based on our audit.
>
> We conducted our audit in accordance with the rules and principles set down by the Ontario Energy Board in its Decision with Reasons dated June 30, 2011, in EB-2008-0346. 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 is accurate in all material respects, and following the rules and principles set down by the Ontario Energy Board that are applicable to the 2012 DSM programs of Enbridge Gas Distribution:

CCM Savings - $xxx,xxx,xxx

DSMIDA Amount Recoverable - $x,xxx,xxx

LRAMVA Amount Recoverable - $x,xxx,xxx

DSMVA Amount Recoverable - $xxx,xxx

In the course of conducting the activities necessary to make the audit statement, reviewers are likely to find opportunities for Enbridge to change procedures or calculations to improve the program estimation of savings, and possibly to enhance program delivery. The final report will include a list of such recommendations.

Draft reports of our findings, opinions, and recommendations will be circulated to stakeholders for consideration and comment on June 7, 2013. Subsequent to review meetings and the issuance of a second draft, ERS will issue a final report by June 24, 2013, incorporating the input of the AC.

SCHEDULE

Key tasks and proposed completion dates are provided in Table 1-1.

Table 1-1. Key Task Schedule

Tasks	Jan	Feb	March	April	May	June
Notice of Contract Award	1/7					
Wave 1 CPSV draft reports	w/o 1/7					
Launch meeting	w/o 1/21					
Auditor work plan, draft		w/o 2/4				
Receipt of requested supporting documentation		w/o 2/11				
Wave 2 CPSV draft reports			w/o 3/18			
CPSV final reports				w/o 4/1		
DSM annual report sent to auditor				4/12		
AC & consultatitve comments on annual report				4/24		
Memorandum on comments to annual report*					5/10	
Complete information system tests*					5/20	
Early review of findings, opinions, recommendations*					5/22	
Draft audit report #1						6/7
Response from AC						6/14
Review meeting w/ AC						6/17
Draft audit report #2						6/19
Review meeting w/ AC						6/21
Final report submitted						**6/24**

ADDENDUM TO THE 2012 AUDIT SUMMARY REPORT

1. This Addendum to the 2012 Audit Summary Report provides:
   - a brief chronology of events and proceedings which confirm that rates in 2012 recovered $28.1 million for DSM instead of $30.91 million as submitted in the original application for the 2012 Clearance of Accounts;
   - a summary of the process followed leading to the revision of the 2012 Clearance Application;
   - a revised impact of Audit results on the Demand Side Management Variance Account (DSMVA) claim.

2. The 2012 Audit Committee ("AC") has endorsed the 2012 Audit including Enbridge's revised post-Audit DSMVA claim as presented in this report.

Background

3. Application materials, as originally filed in October 2013, were premised on the understanding that the sum of $30.91 million, being the DSM budget approved by the Board in EB-2011-0295 on February 2, 2012, was the amount recovered in rates. This amount was comprised of a base budge of $28.1 million plus a 10% increase of approximately $2.81 million in budget for the low income program.

4. In December 2013, Enbridge discovered that the actual amount recovered in rates was $28.1 million, which was the amount approved by the Board in the rate adjustment proceeding for 2012 (EB-2011-0277) on December 1, 2011.

5. The revisions to the 2012 Clearance Application involve making straightforward mathematical corrections to the DSMVA and Rate Allocation; they do not impact the audited results of any DSM Programs for 2012.

Chronology of events and proceedings

6. The Multi Year filing for 2012-2014 (EB-2011-0295) was the subject of a partial settlement agreement which was filed on November 4, 2011. There remained two outstanding issues, one of which related to the proposed increase to the base budget by 10% for the low income program. This issue went to an oral hearing. The settlement agreement was accepted by the Board at the commencement of the oral hearing on February 2, 2012. This included acceptance of the rate consequences of the settlement agreement and the approval of a DSM budget of $30.91 million in 2012.

7. At around the same time, Enbridge was in the midst of a rate adjustment proceeding for 2012. As the Company was in the final year of its IRM, its rates for 2012 were set by the IRM formula and through a rate adjustment proceeding. The rate adjustment application for 2012 was filed on September 30, 2011 (EB-2011-0277). It was the subject of a partial settlement agreement filed November. 29, 2011. The Board accepted the settlement agreement on December 1, 2011 and issued an interim rate order on December 9, 2011 giving approval for interim rates as of January 1, 2012. These approved rates included a DSM budget amount of $28.1 million.

Process

8. Enbridge identified the need for revising the application and sent a letter to the Board on December 13, 2013 to request a suspension of Procedural Order No. 1 in EB-2013-0352. The Board issued Procedural Order No 2 On December 17, 2013 suspending the proceeding until further notice.

9. During the week of December 16, 2013, calls were made to the 2012 AC and Auditor to provide context, answer questions and discuss next steps.

10. The Auditor requested additional material from Enbridge in order to verify the change and submit their revised Auditor's report. After receiving the requested information from Enbridge, the revised report, which only contained mathematical and editorial changes related to the DSMVA, was sent to the AC on December 20, 2013.

11. The first Draft of the Revised Annual Report was sent to the AC for review on December 27, 2013 and a conference call was held with the AC on January 8, 2014.

12. A further draft was sent to the AC on January 8, 2014 and was subsequently forwarded to the Auditor.

13. On January 14, 2014, the Auditor sent their second revision to their report, which reflected their receipt and review of the Revised Annual Report. This did not result in any further material changes related to the DSMVA. The AC has accepted the Auditor's revised report.

Results Summary: 2012 Recommended DSMVA

14. Table 1 is a summary of the figures reported by Enbridge in the 2012 DSM Draft Evaluation Report and 2012 DSM Revised Annual Report compared to the amounts recommended by the Auditor in the Final Audit Report and Revised Final Audit Report and finally the amounts as agreed upon by the Audit Committee.

Table 1: DSMVA Recommendation

	2012 Draft DSM Annual Report[1]	2012 DSM Revised Annual Report[2]	Revised Final Audit Report[3]	Post Audit Recommended Results
DSMVA Amount Recoverable from Ratepayers based on 2012 budget built into rates and actual spend	$303,490 (to be paid to the ratepayers)	$2,506,510 (recoverable from the ratepayers)	$2,506,510 (recoverable from the ratepayers)	$2,506,510 (recoverable from the ratepayers)

The AC supports the foregoing calculations.

[1] 2012 Demand Side Management Draft Evaluation Report, Enbridge Gas Distribution Inc., April 15, 2013

[2] 2012 Demand Side Management Revised Annual Report, Enbridge Gas Distribution Inc., January 14, 2014

[3] Independent Audit of 2012 DSM Program Results Final Report, ERS, January 16, 2014

ALLOCATION TO REVISED DSM VARIANCE ACCOUNTS

1. The chart below illustrates the allocation to rate classes of the DSM Variance Accounts.

2012 Rate Allocation

Rate Class	DSMIDA*	LRAM	DSMVA	TOTAL
Rate 1	$4,287,162		$3,599,494	$7,886,656
Rate 6	$3,750,234		($835,707)	$2,914,527
Rate 9	$0		$562	$562
Rate 110	$0	($2,692)	($620,416)	($623,108)
Rate 115	$162,540	$6,809	$718,588	$887,936
Rate 125	$291,672		$21,087	$312,759
Rate 135	$98,915	$1,441	$252,440	$352,796
Rate 145	$109,126	($28,753)	($324,047)	($243,674)
Rate 170	$117,881	($17,457)	($314,206)	($213,783)
Rate 200	$0		$7,310	$7,310
Rate 300	$0		$1,406	$1,406
	$8,817,529	**($40,652)**	**$2,506,510**	**$11,283,387**

* rounded to the nearest dollar amount

2. The chart below provides the estimated impact of the Clearance of the DSM Variance Accounts on a typical customer's bill in each of the rate classes affected.

	Annual Volume for Typical Customer (m^3)*	Annual Bill for Typical Customer ($)	DSM Amount for Recovery** ($)	Estimated % of Annual Bill
Rate 1 - Heating & Water Heating	3,064	986	6	0.6%
Rate 6 - Commercial, Heating & Other Uses	22,606	6,093	16	0.3%
Rate 9 - Container Service***	220,922	60,584	170	0.3%
Rate 100 - Industrial, small size	339,188	78,126	-	0.0%
Rate 110 - Industrial, small size, 50% LF	598,568	121,571	(427)	-0.4%
Rate 110 - Industrial, avg. size, 75% LF	9,976,120	1,865,017	(7,123)	-0.4%
Rate 115 - Industrial, small size, 80% LF	4,471,609	820,735	8,996	1.1%
Rate 125 - Extra Large Firm Distribution****			4,217	
Rate 135 - Industrial, Seasonal firm	598,567	105,774	3,734	3.4%
Rate 145 - Commercial, avg. size	598,568	115,232	(893)	-0.8%
Rate 170 - Industrial, avg. size, 75% LF	9,976,120	1,643,922	(4,371)	-0.3%
Rate 200 - Wholesale Service			7,310	
Rate 300 - Firm or Interruptible Distribution****			703	
* Annual bills based on October 1, 2013 rates.				
** DSM amounts for Recovery do not include interest amounts that will apply at the time of clearing.				
*** Information is for the average Rate 9 Customer				
**** DSM amounts for recovery for Rate 125 and Rate 300 are for average customers in each rate class				

IGUA INTERROGATORY #2

INTERROGATORY

[Reference: ExB/T1/S1/p.66]

The table indicates that Rate 115 DSM programming accessed $702,852 in program spending during 2012 in addition to the amount budgeted for spending in this rate class. This additional spending is driving the roughly $9,000 average annual bill impact on rate 115 customers proposed for approval in this application (see Ex.B/T4/S1/p. 2).

(a) Please indicate the budgeted spending amount for rate 115 in 2012.

(b) Please provide details of how the additional, unbudgeted funds were spent for rate 115 DSM programming in 2012.

(c) Please confirm adherence to the parameters of the Settlement Agreement applicable to 2012 in respect of DSM spending for rate 115, providing or reproducing copies of the relevant passages from the Settlement Agreement in support of such confirmation.

RESPONSE

This Interrogatory Response has been updated to reflect revised information in the 2012 Clearance of Accounts Application (EB-2013-0352, Exhibit B, Tab 1, Schedule 1, Section 7.0, Table 22). The substance of this response has not changed. The revision reflects a minor correction to the tables showing the amount budgeted for Rate 115. The total amount budgeted for Rate 115 has been revised from $349,479 to $333,743. The resulting DSMVA for Rate 115 has been revised from $702,852 to $718,588.

(a) The budgeted spending amount for rate 115 in 2012 was $333,743 as shown in Table 1 below. This includes Program Costs, contribution to Low Income costs and Overheads

Witnesses: F. Oliver-Glasford
R. Sigurdson

Table 1

Rate 115 Budgeted DSM spending				
Rate	Program Costs	Low Income	Overheads	Total Budget
115	$247,885	$20,758	$65,101	$333,743

(b) The budgeted program spending for Rate 115 was $247,885 as shown in Table 2 below.

In 2012, there were more projects than expected from Rate 115 customers, resulting in incremental program spending of $576,383 for Rate 115. The DSMVA (shown in EB-2013-0352, Exhibit B, Tab 1, Schedule 1, Section 6.0, Table 21) includes the variance in all DSM spending: Program costs, Low Income and Overheads compared to the amounts built into rates. The budget built into rates did not include the additional $2.81 million approved for the Low Income costs. In addition, the Low Income costs exceeded the Board Approved budget by 14% (as shown in EB-2013-0352, Exhibit B, Tab 1, Schedule 1, Section 6.0, Table 20). As with all rates, Rate 115 supported a portion of the Low Income costs which were over the budget built into rates.

Table 2 below shows the budget and actual costs for Rate 115 in all three categories and the total DSMVA for Rate 115 ($718,588).

Table 2

Rate 115				
	Program costs	Low Income	Overheads	Total
Budget	$247,885	$20,758	$65,101	$333,743
Actual	$824,268	$39,909	$188,154	$1,052,331
Variance	($576,383)	($19,151)	($123,053)	($718,588)

(c) As per the Settlement Agreement, the program spending (excluding overheads and Low Income) for Rates 110, 115, and 170 is capped at $2,709,000.

> "However, the parties agree, for 2012 only, that the total budget spent on programs and activities (not including overheads, Market Transformation, and Low Income Allocations) for all customers in rate classes 110, 115 and 170 shall not exceed $2[,].709 million, of which the total budget spent on programs and activities (not including overheads and low Income Allocations) for industrial customers in those rate classes shall not exceed $1[,].797 million." (EB-2011-0295, Exhibit B, Tab 2, Schedule 9, Page 14-15.)"

As shown in Table 3 below, program spending for the 3 rates was $1,616,738, well within the cap of $2,709,000.

Table 3

Rate	Program Costs
110	$459,338
115	$824,268
170	$333,132
Total	$1,616,738
Cap	$2,709,000

Witnesses: F. Oliver-Glasford
R. Sigurdson