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June 29, 2012

VIA RESS and COURIER

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

Dear Ms. Walli:

Re: Natural Gas Reporting & Record Keeping Requirements - Enbridge Gas Distribution 2011 DSM Audit Report

The Ontario Energy Board's (the "Board") Reporting and Record Keeping Requirements for Gas Utilities requires under rule 2.1.12 that annually, by the last day of the sixth month after financial year end, the Utilities file an audited report of the actual results compared to the Board approved Demand Side Management ("DSM") plan with explanations of variances.

Under this rule, Enbridge Gas Distribution Inc. ("Enbridge") is required to file a fiscal 2011 DSM Plan Audit Report by June 30, 2012.

Enbridge has completed the 2011 DSM Plan Audit Report and attaches the results in accordance with the filing requirement as noted.

Should you have any questions related to this, please do not hesitate to call.

Sincerely,

[Original Signed]

Kevin Culbert
Manager, Regulatory Accounting

Attach.

Independent Audit of Enbridge Gas Distribution 2011 DSM Program Results

Final Report

energy & resource solutions

120 Water Street, Suite 350

North Andover, MA 01845

(978) 521-2550

June 27, 2012

Contents

Independent Audit of Enbridge Gas Distribution 2011 DSM Program Results Final Report

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, 2011.

Objectives

The audit's primary objective is to review the Enbridge calculations for total resource cost (TRC), shared savings mechanism (SSM), lost revenue adjustment mechanism (LRAM), and demand side management variance account (DSMVA) and to express an independent opinion on claims to these amounts. When the Enbridge-reported amounts differ from what the auditor believes to be correct, the auditor has calculated alternative values. The audit has the secondary objective of recommending methodological changes to the program administration, verification and audit processes for the future.

Methodology

The auditors began the assessment by conducting preliminary reviews of Enbridge's program verification and technology research reports and general program information, then drafting a work plan, meeting with Enbridge program managers and key technical evaluation support staff, and receiving detailed walk-throughs of major analytical tools by Enbridge administrators.

The core of the large commercial and industrial (C/I) custom project verification process followed. It included intensive desk review of a subsample of twelve projects that were part of the verification samples, followed by telephone discussions with study and/or verification authors. [1] Analysts audited the TAPS program reports for validity and comprehensiveness of analysis to ensure they reflected the Ontario Energy Board's (OEB's) guidance and incorporated the most recent recommendations and performed a limited review of the Enbridge Updated DSM Measures List, then reviewed the TRC master workbook for correct inputs and calculations, reviewed the three sets of calculations required to compute SSM, the LRAM, and reconciliation of the DSMVA, and compared the workbook results with those in Enbridge's Annual Report for proper representation. This audit's scope did not include review of programs or program elements for which Enbridge did not produce reports in 2011 or in 2012 regarding 2011 program performance.

[1] Enbridge project savings are developed and then reviewed and revised at several levels. In a typical custom project the applicant or their vendor develops initial savings estimates. Enbridge then assigns a review engineer to determine if savings is reasonable and if necessary develop an alternate estimate. The final approved savings estimate constitutes the claimed savings estimate. After year end, Enbridge hires a verification firm to evaluate a sample of the project estimates and develop an overall verification adjustment factor. The final step in the process is this audit, whereby auditors review a subsample of the verified custom projects and the verification methodology.

Lastly, methodological recommendations were considered, both for individual verification activities and for the appropriateness of the scope of the 2011 research and program reports overall in the context of research reports completed in years prior to 2011.

Findings

The auditors made five sets of adjustments that affect the TRC calculations or the payment mechanism results. Table ES-1 summarizes the individual changes made that affected the calculated net annual m^3 of gas savings and the TRC. Table ES-2 summarizes the impact of these changes on the resource acquisition, market transformation, and low income weatherization programs.

Table ES-1. Summary of Adjustments by Program Type

Description of Adjustment	Original Value	Audit Value	NET Annual m3 Gas Savings Adjustment	TRC Adjustment for SSM ($)	Audit Report Ref. Page(s)
Audit Adjustments to Results of Custom Commercial and Industrial Resource Acquisition Program					
Custom industrial and agricultural adjustment factors updated to account for sample weights and edits to one industrial project.	Industrial & Agriculture: gas -0.7% elec 0.0% water -9.0%	Industrial & Agriculture: gas 2.01% elec 0.00% water -11.14%	479,162	$817,738	10 through 12 and Appendix B
Custom commercial and multifamily adjustment factors updated to account for sample weights and edits to two commercial projects.	Commercial and Multifamily Residential: gas -2.6% elec 2.8% water -1.0%	Commercial and Multifamily Residential: gas -3.57% elec -5.95% water -12.37%	-383,675	-$1,761,656	10 through 12 and Appendix B
Custom Resource Acquisition Program Totals	N/A	N/A	95,487	-$943,918	N/A
Audit Adjustments to Results of Residential and Low Income (LI) Resource Acquisition Programs					
Correction of Reduction Rates for TAPS programs for Existing Homes	7,754,910 m3 gas 17,554,129 kWh 2,376,342 m3 water	7,685,917 m3 gas 17,488,170 kWh 2,355,547 m3 water	-68,994	-$405,849	16 through 19
Correction of Reduction Rates for TAPS programs for Low Income	85,362 m3 gas 163,107 kWh 19,023 m3 water	84,700 m3 gas 171,579 kWh 18,799 m3 water	-662	$822	16 through 19
Residential and Low Income Resource Acquisition Program Totals	7,840,272 m3 gas 17,717,236 kWh 2,395,364 m3 water	7,770,616 m3 gas 17,659,749 kWh 2,374,347 m3 water	-69,655	-$405,027	N/A
Audit Adjustments to Market Transformation (MT) Program Results					
Correction to drain water heat recovery (DWHR) participant counts	4,052 installed units	2,168 installed units	See Table ES-2	See Table ES-2	21 & 22
Totals	4,052 installed units	2,168 installed units	N/A	N/A	N/A

Table ES-2. Summary of Adjustments to Net Annual Gas m3, TRC, and SSM

Description of Adjustment	NET Annual m3 Gas Savings Adjustment	TRC Adjustment for SSM ($)	SSM Adjustment ($)
Resource Acquisition Programs	25,831	-$1,348,946	-$77,229
DWHR Market Transformation Scorecard Program	Not applicable	Not applicable	-$102,054
Low Income Weatherization Scorecard Program	0	$0	$0
Totals	**N/A**	**-$1,348,946**	**-$179,283**

Overall, the adjustments were minor relative to the overall magnitude of savings and payments. The procedures used are reflective of a mature process. No single adjustment to the results exceeds 0.55% percent of the total portfolio TRC and the net resulting adjustment to the total TRC is a decrease of 0.80%. The nature of the adjustments generally can be characterized as technical corrections to erroneous 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 balanced effort to estimate actual savings.

The audit includes one significant qualifying statement. One of the most important elements of this audit was a review of savings verification efforts contracted by Enbridge to independent firms. While a portion of those savings verification efforts involved spot observation of equipment operating characteristics, others did not and none included logging of pre- or post-installation equipment performance over time. This approach to verification limits their scope to detection of errors and fraud and determination of the "reasonableness" of savings *predictions*. It does not enable validation of savings actually achieved. Thus, while the audit finds Enbridge's savings estimates to be reasonable and unbiased, it cannot fully validate the savings achieved.

Savings Verification Statement

We have audited Enbridge's Annual Report, TRC savings, SSM, LRAM, and DSMVA for the calendar year ending December 31, 2011. The Annual Report and the calculations of TRC, 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 (OEB) in its Decision with Reasons dated August 6, 2006 in EB-2006-0021. 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 herein 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 forth by the OEB that are applicable to the 2011 DSM programs of Enbridge:

- TRC savings – $171,770,167
- SSM amount recoverable – $6,688,629
- LRAM amount recoverable – -$54,905 (to be paid to the ratepayers)
- DSMVA amount recoverable – $535,804

For comparison, the draft values previously reported by Enbridge for 2011[2] were:

- TRC savings – $173,119,113
- SSM amount recoverable – $6,867,911
- LRAM amount recoverable – -$55,619 (to be paid to the ratepayers)
- DSMVA amount recoverable – $535,804

Recommendations

In addition to quantifying the savings and recoverable amounts, auditors identified nine opportunities for Enbridge to enhance program operation and verification procedures going forward. The auditors consider Recommendation 1 the most significant. The recommendations are briefly summarized below and addressed in more detail in the body of the report.

1. Change the custom verification protocols to include more intensive investigation of projects, including post-retrofit equipment performance measurement over time.
2. Collect custom project analysis files in native format (e.g. Excel workbooks) rather than just hard copy or PDF format, to aid later evaluation.
3. 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 that includes consideration of the sample expansion weights.
4. The custom 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 and report this value.
5. Collect more detailed final project cost information such as invoices, payment requisitions, or summary information from participants' in-house tracking or accounting systems.
6. Use data collected over the last few years to extrapolate the likely proportions of high- and medium-flow showerheads replaced instead of continuously bag testing.

[2] All values from *Demand Side Management 2011 Draft DSM Annual Report*, Enbridge Gas Distribution Inc., DSM Research and Evaluation, April, 2012 (SSM amounts combined for resource acquisition and scorecard programs) except LRAM, which is from 2011 FE-PE_Actual vs Budget_LRAM_Audit_Step 4_May 15.xlsx, provided to ERS from Corrie Morton, Enbridge DSM Research and Evaluation, May 22, 2012.

7. 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.
8. Provide the residential verification firm with the spreadsheets and guidance required to report adjustment factors rather than just providing the calculation inputs. This will improve reporting consistency.
9. Future audit scope should include review of a sample of participant records to verify the participant counts and tracking procedures for programs such as the DWHR programs 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.
10. Prioritize and complete free ridership research in 2012 for completion prior to next year's verification analysis.
11. Consider incorporating spillover research with the free ridership decision-making data collection for selected Enbridge programs.
12. 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.

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 evaluation audit committee (EAC) 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.

1.1. Objectives

The primary objective of this audit is to review the Enbridge claims for TRC, SSM, LRAM, and DSMVA for the calendar year ending December 31, 2011 and to express an independent opinion on these amounts. Enbridge contracted with ERS to perform the audit. If the Enbridge-reported amounts differed from what ERS believed to be correct, ERS presented alternative values for the EAC 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 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 August 6, 2006 in EB-2006-0021.

1.2. Methodology

The methodology followed by auditors is detailed in Appendix A: *Independent Audit of Enbridge Gas Distribution 2011 DSM Program Results, Final Work Plan* and briefly summarized here.

Enbridge delivered the first program files to ERS for review on March 26, 2012. The information included both verification and technology research reports and general program information to help the auditors understand Enbridge's programs. The lead auditors began participation in weekly EAC conference calls, evaluating the methods and requesting and receiving additional files. After an orientation period auditors drafted the Work Plan on April 19 and met with Enbridge staff in Toronto on April 24 and 25. Enbridge arranged meetings between the auditors and all principal program managers and Enbridge's key technical evaluation support staff. The review process included detailed walk-throughs of major analytical tools used by the Enbridge senior staff responsible for savings estimation and related calculations. Tools reviewed included both the commercial e-tools and industrial e-tools and the TRC workbook. Examination of Enbridge's DSM analysis, reporting, and tracking system (DARTS) was not in scope. The auditors also met with the EAC and identified additional topics for investigation. Appendix A includes a list of the documentation provided for auditing.

This audit's scope did not include review of programs or program elements for which Enbridge did not produce reports in 2011 or in 2012 regarding 2011 program performance. Specifically, there was no auditing of the updated DSM measures list, DARTS, e-tools' formulae[3], the performance

[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.

characterization of residential thermostats, or the boiler and steam trap reports concluded in 2011 but which the prior auditor reviewed. Review of Enbridge's substantiation sheets was selective. Auditing of the low-income weatherization program was limited to a review of the Scorecard. Auditing of the small commercial offerings was limited to review of the pre-rinse spray valve measure research report and the TRC calculator. A comprehensive review of the DSM measure list and substantiation sheets was not performed.

The core of the large commercial and industrial (C/I) custom project verification process was intensive desk review of a subsample of twelve projects that were part of the verification samples, followed by telephone discussions with study and/or verification authors when questions arose. The audit subsample accounted for 68% of the verification sample's total annual natural gas savings. The reviews focused on appropriate baselines, cost estimates, energy savings calculations, and measure life reasonableness. If the auditor believed a different savings estimate was more appropriate for a reviewed project in the subsample, analysts adjusted the inputs for the TRC analysis.

Enbridge and its contractors completed program reports on the three residential TAPS programs (regular, low income, and direct mail/bill insert) and completed two research reports on specific commercial measures. Analysts audited the reports for validity and comprehensiveness of analysis to ensure they reflected OEB guidance and incorporated the most recent recommendations.

The auditors performed a limited review of the Enbridge Updated DSM Measures List (savings basis) submitted to the OEB by examining selected substantiation sheets. This list is the basis for a significant portion of the prescriptive savings.

After reviewing the 2011 individual components, the auditors reviewed the TRC master workbook for correct inputs and calculations, the three sets of calculations required to compute SSM, the LRAM, and reconciliation of the DSM variance account (DSMVA), and reviewed the results transfer for proper representation of results in Enbridge's Annual Report.

Lastly, methodological recommendations were considered, both for individual verification activities and for the appropriateness of the scope of the 2011 research and program reports overall in the context of research reports completed in years prior to 2011.

Audit activities continued through mid-May, with the product being this draft report due May 25.

1.3. Report Layout

The balance of this audit report has four major sections. The first section reports on the audited findings related to Enbridge's three program research reports completed in 2011. The second section reports on the same for Enbridge's three financial compensation mechanisms. The third presents the recommendations. Lastly, the appendices contain the previously submitted audit work plan, an example audit review checklist, presentation of detailed findings associated with one of the audit's adjustment factor calculations, and a flow diagram for the TRC workbook.

2. PROGRAM AND TECHNOLOGY AUDIT

Section 2 presents the program and technology audit findings.

2.1. Commercial, Multi-Residential, & Industrial Custom Incentive Verification

Enbridge's custom projects contributed over 85% of the portfolio's annual natural gas filed savings in 2011. To verify the filed savings values, Enbridge contracted with a statistics firm to execute the sample design as described in the protocol[4] then contracted with engineering firms to investigate the sampled projects. The samples included fifteen industrial and agricultural projects and twenty-six commercial and multi-residential projects.

The audit team selected a subsample of twelve projects from the verification samples to audit. The selection process assigned separate strata for industrial, agricultural, commercial/multi-residential retrofit, and commercial/multi-residential new construction, and made census selections of projects exceeding one million m3 reported savings. While statistically structured, the selection was not intended to be an optimized design. Rather it was designed to ensure representation of each customer type and to include projects both with and without water savings, both with large and small reported savings, and with a broad distribution of energy efficiency technologies. The audit subsample accounts for 68% of the verification sample's total annual natural gas savings.

The audit's project-specific scope included review of inputs and outputs that could affect the TRC calculation, principally measure annual savings (natural gas, electricity, and water), measure cost, and measure life. The project-specific reviews also included checks for the accuracy of each project's baseline definition. After determining the adjustments appropriate for each project in the subsample, the auditors calculated an overall subsample-based weighted average adjustment factor to the energy savings. As is detailed below, auditors made one adjustment on measure life. It is not appropriate to calculate an extrapolated adjustment factor for the life parameter, as the sample design was based on annual energy savings rather than life or lifetime energy savings, so auditors adjusted the measure life for the individual audited project alone.

This section reports on project-specific findings and then on findings related to the aggregated results and process. Auditors found two types of two types of corrections that need to be applied to the Company's custom C&I project savings estimates.

- The first adjustment is a correction to the engineering estimates of savings provided by the verification engineers based on audit engineering review of a subsample of verified projects. Section 2.1.1 and Appendix B describe the engineering adjustments made to individual projects. Section 2.1.2 and Table 2-2 aggregate the effects of the auditor engineering findings into a set of adjustment factors.

[4] Proposed Sampling Method for Custom Projects, memorandum from Gay Cook, Summit Blue, to Judith Ramsay, Enbridge Gas Distribution et al, October 31, 2008 provides the core procedure. Sample Selection for 2008 Custom Projects – Wave I, memorandum from Gay Cook, Summit Blue, to Judith Ramsay, Enbridge Gas Distribution et al, December 19, 2008, demonstrates the application adds consideration for measures that save water to the method.

- The second adjustment is a statistical correction to the way the verification firm developed the aggregate savings adjustment factor from the individual project reviews. Section 2.1.3 and Table 2-3 present the set of adjustment factors needed due to this change.

These two adjustments are independent of one another. The realization rates associated with the two adjustment factors must be multiplied together to compute the combined overall audited realization rates and adjustment factors. The combined effects of these two corrections are presented in Section 2.1.4 and Table 2-4 in that section.

2.1.1 Custom Project-Specific Findings

The auditors concluded that the natural gas savings should be adjusted for two of the twelve projects. The results of the review for those projects with different audited results are shown in Table 2-1 below.

Table 2-1. Custom Projects with Audited Estimates that Differ from Verification Estimates

Project #	Verification Savings	Auditor Savings	Reason for Auditor Change
NP.085.11	3,279 m3/yr of NG $9,246 installed cost 15-year measure life	21,858 m3/yr of NG $9,246 installed cost 15 years on insulation measure 5 years on other measures	The auditor found that metered data supports the savings claim; additional data on installed measures supports savings order of magnitude. Audit updates to measure life to account for shorter life (5 years) of operational improvement measures and longer life of insulation measures (15 years).
NC.011.11	189,372 m3/yr of NG 73,220 kWh/yr $281,000 installed (incremental) cost 25 year measure life	189,372 m3/yr of NG 67,829 kWh/yr $281,000 installed (incremental) cost 25 year measure life	The auditor found that in the 2011 evaluation, it was noted that the base case insulation levels were too low and gas use associated with heating was adjusted accordingly. The evaluator did not adjust space cooling energy (kWh) to account for the improved base case insulation levels. The auditor revised the kWh savings to reflect the increased cooling performance of the base case due to increased insulation levels
ALL.034.11	1,438,419 m3/yr of NG $1,536,684 installed cost 15-year measure life	1,557,340 m3/yr of NG $1,536,684 installed cost 15-year measure life	The auditor found that Enbridge's initial claimed savings were based on more rigorous analysis than the verification savings; auditors adopted EGD's savings estimate rather than the evaluation firm's estimate.

The auditors prepared a checklist template to use as a review tool and completed it for each project. Appendix B includes one-paragraph summaries of the audit review findings for each reviewed custom project and one example of a completed project checklist.

2.1.2 Custom Project-Specific Engineering Adjustment

After weighting the audit-subsample results according to stratum expansion weights, the additional adjustment factors are as shown in Table 2-2. In this report a positive adjustment factor indicates that the auditors found the savings to be greater than was verified. For example, an auditor adjustment factor of 1% means that audited savings are 101% of the previously reported savings.

Conversely a negative adjustment factor indicates savings should be reduced. The realization rates associated with these subsample adjustments should be multiplied with the realization rates associated with the verification studies to determine the combined realization rate and adjustment factor.[5] The net effect of the increase in the adjustment factor was to increase the total portfolio TRC by 0.81%.

Table 2-2. Audited Custom Subsample Engineering Review-Based Adjustment Factors

Verification Report	Natural Gas Adjustment Factor	Electric Energy Adjustment Factor	Water Adjustment Factor
Industrial & agriculture	0.90%	0%	0%
Commercial & multi-residential	1.61%	-0.44%	0%

2.1.3 Custom Statistical Weighting Adjustment

Aggregate results weighting. The custom program verification studies calculate the overall adjustment factor by computing the weighted average factor for the sample projects, with the weighting based on energy savings. The weighted average also should account for the differing expansion weights associated with each project. For example, the sample design protocols dictate that 3 of the 6 largest commercial renovation projects be verified and that 7 of the 160 remaining smaller projects be verified. The final weighted average adjustment factor should account for the fact that the 3 largest projects' adjustment factors each effectively represent 2 projects (6/3) in the population, whereas each of the 7 other sampled projects effectively represent about 23 projects (160/7).

Appendix C details the corrected calculations in tabular format for natural gas. The same procedure applies for electricity and water savings. The change in the adjustment factor after accounting for this adjustment is as shown in Table 2-3. The net effect of correcting the aggregate results calculation is that the custom industrial adjustment factor and associated custom industrial and agricultural program TRC increases by 1.92% and the custom commercial adjustment factor and associated custom commercial program TRC decreases by 3.27%.

[5] Total adjustment factor = Total realization rate (RR) – 100%. RR = Audit realization rate (RRa) × Verification realization rate (RRv). RRa = Audited subsample weighted savings / Verified subsample weighted savings = 100% - Audit adjustment factor. RRv = Verified sample weighted savings / Filed sample weighted savings = 100% - Verification adjustment factor.

Table 2-3. Custom Sample Statistical Review-Based Adjustment Factors

Verification Report	Natural Gas Adjustment Factor	Electric Energy Adjustment Factor	Water Adjustment Factor
Industrial & agriculture			
Verification report	-0.7%	0.0%	-9.0%
Audited	1.1%	0.0%	-11.1%
Net difference	1.8%	0.0%	-2.1%
Commercial & multi-residential			
Verification report	-2.6%	-2.8%	-1.0%
Audited	-5.1%	-5.5%	-12.4%
Net difference	-2.5%	-2.7%	-11.4%

2.1.4 Custom Combined Overall Audited Adjustment Factors

Enbridge's claimed savings associated with each project in the population must be multiplied by the audited realization rates associated with both the Subsample Engineering Review-Based Adjustment Factors in Table 2-2 and the Sample Statistical Review-Based Adjustment Factors in Table 2-3.[6] Table 2-4 summarizes the final combined adjustment factors.

Table 2-4. Audited Custom Combined Adjustment Factor

Verification Report	Gas Adjustment Factor	Electric Adjustment Factor	Water Adjustment Factor
Industrial & agriculture	2.01%	0.0%	-11.14%
Commercial & multi-residential	-3.57%	-5.95%	-12.37%

2.1.5 Custom Other Findings

Auditors made other observations during custom program review that do not affect the quantitative results.**Final statistical results.** Each year's custom program verification sample designs have a goal of 10% relative precision at 90% confidence. Sample sizes are calculated to meet this goal based on the assumption of a 0.5 error ratio. After verification activity completion, the verification studies neither report the actual relative precision compared to the 10% target nor report the actual error ratio, which could be used in the next year's design. This leaves the reader uninformed regarding the verification's statistical precision performance relative to the goals. Given the low variance that occurred in the past several years' custom verifications, it also is driving samples to be unnecessarily high. Table 2-5 provides this information based on auditor calculations.

[6] Combined Adjustment Factor in Table 2-4 = $RR_{combined} - 1$. $RR_{combined} = RR_{subsample} * RR_{sample}$. RRsubsample = Table 2-2 Adjustment Factor -1. RRsample = Table 2-3 Adjustment Factor – 1. For example, for Industrial & Agriculture natural gas, the combined adjustment factor in Table 2-4 = $(1+AF_{Tbl\ 2-2})*(1+ AF_{Tbl\ 2-3}) -1 = (1+0.0090)*(1+0.011) -1 = 0.0201$.

Table 2-5. Auditor Calculation of Verification Study Savings Correlation with Enbridge File Savings

Custom Verification Report	Relative Precision at 90% Confidence	Error Ratio
Industrial & agriculture	3.4%	0.05
Commercial & multi-residential	7.0%	0.19

Note that the statistics above are based on the verification study data as presented and do not reflect the auditor adjustments described earlier in this section.

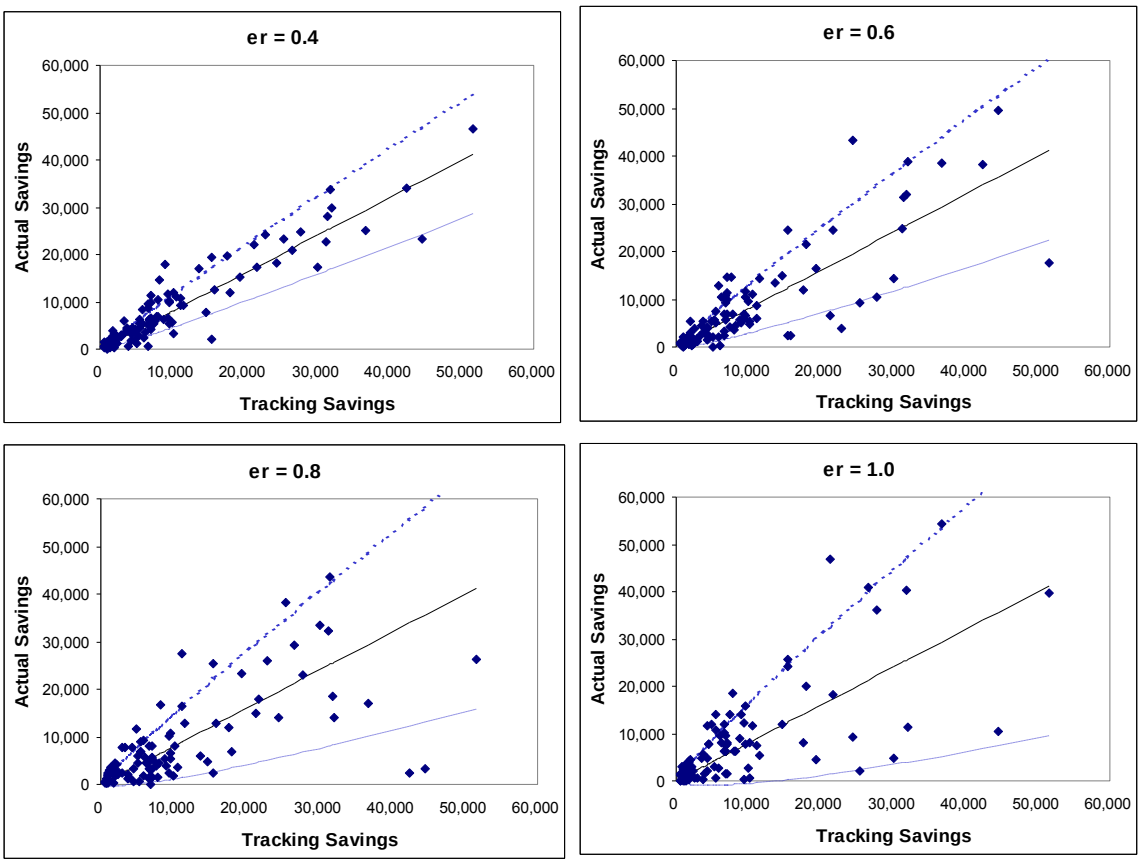
Level of rigor for measurement and verification (M&V). Desk review of project files supported by site inspections and spot measurement but without extended measurement over time is a limited form of verification.[7] Such verification will find errors or fraud and will affirm the "reasonableness" of savings predictions, but without M&V cannot truly validate savings that are actually occurring. The industrial custom project verification engineers found no need to adjust twelve out of the fifteen reviewed projects. Those that were adjusted were done so by less than 10%. No water savings estimates were adjusted and only one electric estimate was adjusted. For commercial projects the trend was similar. Seventeen of twenty-six were left unadjusted for natural gas savings. This is a small amount of correction given the advantages that hindsight estimation of savings offers.

Figure 2-1, from *The California Evaluation Framework*[8] (the Framework), illustrates different variances between reported and evaluated savings for four generic programs. As the charts show, a larger error ratio indicates less correlation between the two estimates.

[7] The typical measurement periods for equipment that operates independently of seasons is two to four weeks. If weather, seasonal production, or other cyclic variables materially affect loading, the measurement period may need to extend to several months.

[8] *The California Evaluation Framework,* by the TecMarket Works team for the California Public Utilities Commission and the Project Advisory Group, June 2004.

Figure 2-1. Error Ratio as a Measure of Correlation between Tracking and Evaluated Savings



The Framework states that "if the tracking system is expected to provide quite accurate estimates of the actual savings of most sample projects in the evaluation study then the error ratio is likely to be relatively small, e.g., near 0.4. This might be the case for example, if the program provides . . . fairly detailed analysis of each project." If poor estimates are expected the error ratio is likely to be closer to 1.0. The standard protocol Enbridge requires uses a 0.5 error ratio for the sample design.

It is generally considered that predicting savings for natural gas projects is harder than for electric projects due to difficulties in pre-retrofit metering. This leads one to expect error ratios to be larger. Table 2-6 shows the evaluated error ratios for a number of evaluated C/I natural gas programs.[9] All were based on or mostly based on post-retrofit metering.

Table 2-6. Error Ratios for Non-Enbridge Natural Gas Efficiency Programs

Portfolio or Program Type	Error Ratio for the Realization Rate Estimate ($\hat{er}$)	Error Ratio for the Realization Rate Estimate Excluding Outliers* ($\hat{er}$)
Commercial/industrial new & retrofit	1.08	0.92

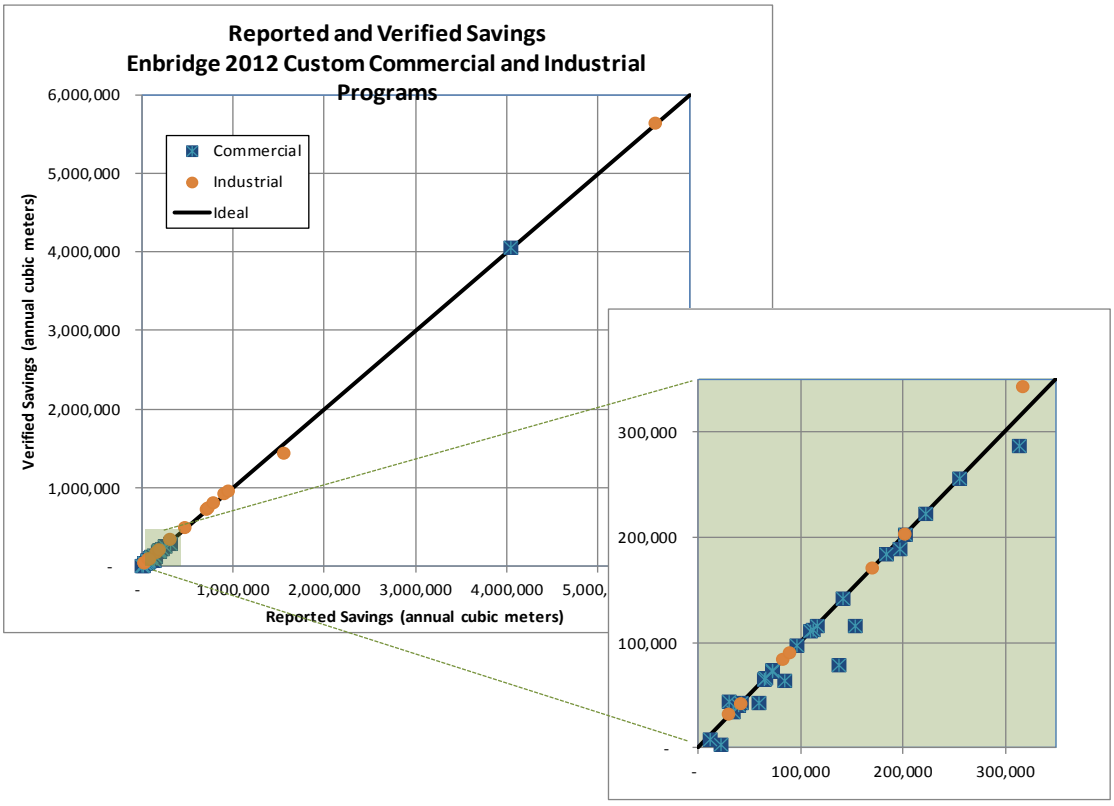
[9] *How to Design a Gas Program Impact Evaluation*, Jonathan B. Maxwell, Energy & Resource Solutions (ERS), College Station, TX, Kathryn Parlin, West Hill Energy & Computing, Chelsea, VT, AESP National Conference, January 2011.

Residential single family new construction	1.14	1.14
Multifamily retrofit	1.08	1.08
Commercial retrofit (major)	1.94	1.51
Commercial standard performance	1.14	1.14
Commercial/industrial bid program	0.30	0.30
Commercial retrocommissioning – Utility A	3.20	1.00
Commercial retrocommissioning – Utility B	1.26	1.19
Commercial retrocommissioning – Utility C	2.06	2.06
Industrial – fabrication	0.30	0.30
Agricultural & food processing	1.40	0.62
Non-res prescriptive pipe insulation measure	0.29	0.29

*Outliers were defined as projects with realization rates greater than 10 or less than 0.

With this background information, consider Enbridge's verification results, as shown in Figure 2-2.

Figure 2-2. Enbridge Custom Project Correlation between Tracking and Verification Savings Estimates



Enbridge's reported and verified results have unusually high correlation. The auditor-calculated error ratio for the combination of C/I projects is **0.14**. While it is possible that the reported estimates are excellent, it is likely that much of the explanation for the high correlation is that the

level of scrutiny the verification engineering firm could afford to apply to each review was simply not enough to discover substantive issues and also provide defensibly better estimates. Specifically, the verification activities do not fund independent evaluation of savings with logged data. (This audit, in turn, repeated this same weakness of the verification).

There are likely two forces driving the limited amount of discovered variance: budget restraints and calendar constraints. When the verification (and audit) cycle must be completed in just a couple of months after the program period end, it is impossible to engage in useful metering over time. The result is a pair of activities that enables discovery of computational errors and theoretical flaws but not of variations in true equipment performance compared to expectations.

2.2. Residential TAPS Program

The TAPS program is comprised of three separate programs for the delivery of energy efficient products to residential customers. These include the Partners Program, where participating contractors visit households to deliver and install products, a Low Income Partners Program with a slightly different set of products, and a Direct Mail/Bill Insert Program where kits are mailed to participants for self-installation. There was also a fourth program targeted to new homes and delivered through participating building contractors under the name of Energy Savings Kits (ESK). Enbridge did not claim ESK savings in 2011 to compensate for premature savings claims associated with equipment that was distributed but not installed in 2010.

Each of the programs provided low-flow showerheads, kitchen and bathroom aerators, and CFL lamps to participants. The low income program also provided programmable thermostats. Similar offerings were made to the multi-residential sector.

A third-party evaluator completed site visits for the multi-residential showerhead program and phone surveys for the other programs 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. In general 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.

Inconsistencies in the reports and/or suggestions for modification to the verification approach are listed below.

1. For products like CFL lamps and showerheads, where there can be multiple units installed per household, there appeared to be inconsistencies in the reporting of the number of products installed per household. The reported percentage values when multiplied by the reported sample sizes frequently did not result in whole number values, suggesting, that either the percentage referred to a different sample size, or the calculation was in error (i.e., if the sample was 100 and it was reported that 10.4% of the homes in the sample installed two units, that implies that 10.4 respondents reported that they installed two units.)

   Greater clarity with regard to exactly what the 10.4% represents (i.e., percentage of total sample, percentage of sample minus "don't recall" responses, percentage of sample that installed some lamps) would help to ensure that the reported values are interpreted and utilized correctly in the reporting of program savings by the utility.

Savings for most of the products provided in these programs are calculated per household rather than per unit, and even for bathroom aerators and CFL lamps where the lamps installed per household data is used, the magnitude of any errors introduced by this inconsistency are expected to be very small.

2. The treatment of the "don't recall" responses to the survey questions was inconsistent. Typically participants with this response were eliminated from the survey and the reported sample size was reduced. We believe this approach is the correct one but it was not always followed. One example of an exception can be found in the report for the Direct Response Program (Section 5.2 showerheads). In this case there was a single "don't recall" response that was not removed from the sample and was included in the overall percentage reported as installing at least one showerhead. The resulting inaccuracy in the reported percentage installed was carried through to the Enbridge determination of a reduction factor and the ultimate savings reported for the program. Once again, because the number of "don't recall" responses is small, (1 out of 100 in this case), the impact on reported program savings is minimal, but consistent handling of the data should be stressed for future evaluations.
3. The report for the Partners Program provides very good comparison data between the various participating contractors and between various years the program has operated, which is useful information for the program managers and planners. Information related to overall installation rates was not provided for this program with the same level of detail that exists for the other smaller programs, making the derivation of the percentage installation rates less transparent. An example of this is in the verification report, which indicates that 90.1% of participants "received kitchen and/or bathroom aerators," but does not differentiate between the two, forcing Enbridge to assume the same installation rate for both products, reducing the precision of the resulting reported savings.

2.2.1 TAPS Savings Calculation Audit

Enbridge used the percentage installed, percentage removed after installation, and other inputs from the verification reports related to utilization rates to calculate reduction factors for each measure type in each program. These reduction factors were then used along with free ridership factors and defined per unit savings to predict natural gas, water, and electric savings resulting from each measure.

The Enbridge approach to determining reduction factors is essentially sound and followed prior audit recommendations, but the slight errors in execution and inconsistencies in the percentage installed and removed values provided in the survey result summary reports and discussed in the sections above were carried forward in these calculations.

The most consistent error results from the method used to arrive at a term labeled *percentage material remaining after removal*. This term is intended to represent the percentage of the installed units that remained installed. The reduction factor is determined by subtracting the product of the percentage *distributed,* percentage *installed*, and *percentage remaining after removal* terms from 100%.

Enbridge incorrectly derives the *percentage material remaining after removal* term by subtracting the percentage removed values taken from the verification reports from 100%. For example the survey results report for the TAP Kit Direct Response program reports that for a sample of ninety-eight kitchen aerators, 50% (or forty-nine units) were installed and 2% (or 2 units) were "installed but later removed." Enbridge calculates the *percentage remaining after removal* as:

$$100\% - 2\% = 98\%$$

Because the percentage removed values provided in the verification reports actually represent a percentage of the total sample rather than a percentage of the units that were initially installed, the percentage of material remaining value calculated by Enbridge is slightly in error here and for several other measures for which units that were removed after installation were reported as a percentage of the total sample. The correct value for the *percentage remaining after removal* as it is used to calculate the reduction factor should be calculated as:

$$(49\ Units\ installed - 2\ Units\ later\ removed) / 49\ Units\ installed = 95.9\%$$

Because the number of units removed after installation is small, the resulting error in reported savings is also relatively small.

In other cases, the percentage values used by Enbridge in the reduction factor calculation do not exactly match those provided in the survey reports. One example of this is the calculation of a reduction rate for CFL lamps supplied under the Low Income Partners Program; the Enbridge calculation is based on 90% of the materials being distributed, while the evaluation report for the program show this value as 95%. These errors are relatively few and could be associated with the use of quarterly survey values by Enbridge as opposed to the numbers taken directly from the summary annual verification report.

Table 2-7 provides a comparison of the reduction factors used by Enbridge in the TRC report and the validated reduction factors derived from evaluation survey report data that included the *percentage distributed, percentage installed, and percentage remaining after removal.*

Table 2-7. TRC Reduction Factors

Program /Measure Description	Correction Reason (1 = Incorrect calculation of *% remaining after removal term*; 2 = % values inconsistent with verification survey reports)	Reduction Factor from Enbridge 2011 Annual Report	Auditor Revised Reduction Factor
TAPS Partners – Showerheads >2.5 gpm	1	36.53%	37.19%
TAPS Partners – Showerheads 2.1 – 2.5 gpm	1	36.68%	37.19%
TAPS Partners – Kitchen aerator	1	39.22%	39.53%
TAPS Partners – Bathroom aerator	1	46.19%	46.59%
TAPS Partners – CFL 13 W (four lamps)	1	16.63%	16.97%
TAPS ESK Showerheads 2.1 – 2.5	2	49.68%	49.99%
TAPS ESK Kitchen aerator	1	51.00%	52.04%
TAPS ESK Bathroom aerator	1,2	66.54%	66.49%
TAPS ESK CFL 13W (four lamps)	No change	1.00%	1.00%
TAPS Partners LI – Showerheads >2.5 gpm	1, 2	29.43%	29.45%
TAPS Partners LI – Showerheads 2.1 – 2.5 gpm	1, 2	29.43%	29.45%
TAPS Partners LI – Kitchen aerator	1, 2	21.6%	24.34%
TAPS Partners LI - Bathroom aerator	2	33.00%	35.01%
TAPS Partners LI – CFL 13 W (two lamps)	1, 2	13.68%	8.43%
TAPS Partners LI – CFL 26 W (two lamps)	1, 2	13.68%	8.43%
TAPS Partners LI - Thermostats	No change	26.00%	26.00%

The changes in the validated reduction rates are relatively small, about 0.80% of the total TRC for the residential programs and 0.23% of the portfolio TRC, but in almost all cases the validated reduction rates are higher than the values used in the TRC calculations, making the cumulative impact more significant. The cumulative impact of these changes on overall savings reported in the TRC spreadsheet is shown in the Table 2-8.

Table 2-8. Cumulative Impact of Reduction Rate Changes

Program Group	Natural Gas Savings Impact (m^3/yr)	Electric Savings Impact (kWh/yr)	Water Savings Impact (m^3/yr)	Net TRC Benefits ($)
Total existing homes	-68,994	-65,959	-20,795	-$405,849
Total low income	-662	8,472	-223	$822
Combined	-69,655	-57,487	-21,018	-$405,027

It should be noted that no savings related to the new construction component of the TAPS program are reported for 2011. The explanation for this is that savings reported for this program in 2010 included some kits that were distributed to builders in 2010, but not installed in new homes until 2011. In an effort to ensure savings were not double counted, it was decided that the savings from this program would not be reported for 2011. It is likely that some kits distributed to participating builders during 2011 were actually installed in the same year, producing some level of savings that is not reflected in the TRC calculations.

2.2.2 Observations on Bag Test Protocols

For the Partners, Low Income Partners, and Multifamily Residential programs, Enbridge differentiated savings attributable to showerheads depending upon the flow rate of the pre-existing showerheads. Savings of 50 m^3 per participant for pre-existing showerheads with flow rates between 2.1 and 2.5 gpm, and 82 m^3 per participant for pre-existing showerheads with flow rates greater than 2.5 gpm were assigned.

The percentage of overall participants in each of the two categories is reportedly based upon data resulting from "bag tests" conducted and reported by the installing contractors to document the actual pre-existing flow rates. The breakdown of participants listed on the TRC spreadsheet suggests that 68.25% of participants receiving showerheads under the Partners Program had baseline showerheads with flows greater than 2.5 gpm; the corresponding percentage for participants under the Low Income Partners program was 81.9%. Since there were no on-site contractors to conduct bag tests and report results for the ESK Direct Response program, all showerhead savings for this program were calculated assuming the lower 50 m^3 per participant value.

Savings reported for showerheads under the Multifamily residential program used a per unit savings value of 69 m^3, suggesting that bag-test results for this program predicted that 59.4% of the participants had pre-existing showerheads with flow greater than 2.5 gpm.

Enbridge should be recognized for implementing the bag-test procedure and for documenting and reporting actual baseline flow rates. This level of documentation of baseline conditions is well beyond that typically expected for this type of measure.

2.2.3 Compact Fluorescent Lamp Assumptions

There are two assumptions related to the compact fluorescent lamps (CFLs) that may be generous with respect to electric energy savings. First, it is assumed that all lamps eventually are installed and used and, in particular, that never-installed lamps are in storage and eventually will be installed and accrue savings. The auditors understand that this interpretation was agreed upon previously and that Enbridge is following approved guidance from the OEB. For homes that report already having installed one or more lamps, this is reasonable. For some of the homes that have not installed any of the program CFLs it is likely that they were disposed of without installation due to lack of accommodating fixtures, dissatisfaction with light quality, breakage while in storage, and other similar reasons, and no savings should be associated with them.

Second, Canadian energy efficiency regulations are likely to drive standard practice lighting to technologies more efficient than the current substantiation sheet's baseline of incandescent lamps

within 3 years. Several years after that, CFLs are likely to be the baseline technology.[10] For this reason using an 8-year measure life for CFLs installed in 2011 likely overstates lifetime savings. As with the prior observation, auditors understand that this interpretation was agreed upon previously, and that Enbridge is following approved guidance from the OEB. No adjustment has been made to the calculations.

2.2.4 TAPS Summary

In summary, the auditor believes that the verification surveys were well constructed and generally provide sufficient information to accurately report implementation rates. Methodologies and practices employed by Enbridge in reporting savings based on these values are acceptable and produce results that are within the anticipated range of accuracy and precision.

2.3. Technology Research Reports

Enbridge completed two technology research reports in 2011: one on multi-residential showerheads and one on commercial kitchen pre-rinse spray valves.

2.3.1 Multi-Residential Showerheads

Enbridge provided high efficiency showerheads to 25,233 participants in multi-residential residential buildings during 2011. A verification study consisting of site visits to 493 household in twenty-nine representative buildings was conducted by the study contractor.

The study concluded that 84.5% of the showerheads distributed under the program are still in place. This result was very consistent with the 85.0% remaining result determined in a similar survey for 2010 installation. Enbridge used this value to calculate a reduction factor of 15.5% and predict overall program savings in the TRC 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.

2.3.2 Pre-Rinse Spray Valves

During the 2011 program year, Enbridge processed 1,508 incentive applications representing 2,520 energy efficient pre-rinse spray valves. A consulting firm was contracted to conduct an evaluation of this program with a goal of determining how many of the spray valves receiving incentives remained in place.

Sixty-five of the 1,508 food service establishments that received incentives were randomly selected for site visits. The site visits revealed that thirty-three of the ninety-nine spray valves that received incentives were still in operation. This represents 33.3% that were installed and remain in use. Additional survey data indicates that 31.3% of the valves represented by the sample were never installed, and 25.3% were initially installed and later removed for various reasons.

[10] See, for example, Table 2-4 of *Northeast Residential Lighting Strategy,* by Energy Futures Group et al, presented by Northeast Energy Efficiency Partnerships, March 2012.

Enbridge used the reported 33.3% remain-in-place value to calculate a reduction factor of 66.7%. The TRC spreadsheet differentiates savings associated with the spray valves based on anticipated utilization, with unit savings values of 1286 m^3 for full service valves, 339 m^3 for limited duty valves, and 318 m^3 for others. The 66.7% reduction factor was applied to all three categories of valves. Additional observation during the verification survey might have allowed for the determination of the percentage remaining in service for each utilization type, leading to a more accurate projection of overall program savings. If this program is to be continued, this modification to the evaluation effort is recommended.

2.4. Drain Water Heat Recovery Market Transformation Scorecard

Enbridge's Drain Water Heat Recovery (DWHR) Program is a market transformation effort targeted at the low rise residential new construction market. The program was originally launched in 2009, changes were made in 2010 to track the number of units installed, and incremental first-time builders were continued in 2011. The DWHR Program utilizes a scorecard approach to benchmark the program's performance. Key metrics included in the program scorecard are the number of units installed as a percentage of housing starts and the incremental first-time new builders enrolled in the program. Table 2-9 summarizes the DWHR market transformation program scorecard, including the 2011 outcomes and the resulting SSM attributable to the program.

Table 2-9. DWHR Market Transformation Scorecard from Enbridge's 2011 Annual Report

Drain Water Heat Recovery		2011 Metric Value Levels			Weight	2011 Metric Value Actual Results	SSM Achievable at 100%	SSM Achieved
Element	Metrics	50%	100%	150%				
Ultimate outcomes	Units installed (new buildings) as percentage of housing starts (across all builders)	4,800	5,280	6,000	/80	4,052	$520,000	$219,492
Program performance	First-time new builders enrolled (incremental)	20	25	30	/20	60	$130,000	$195,000
Total								**$414,492**

The auditors noted that the ultimate outcomes metric (the number of DWHR units installed) in 2011 fell below the 50% target, while the program performance metric (first-time new builders enrolled), exceeded the 150% target. Enbridge attributed the lower-than-anticipated number of DWHR installations to higher-than-forecasted housing starts in 2011 and overly aggressive installation targets compared to 2010. Enbridge established their targets based on a forecast of 22,396 housing starts in 2011; the actual number of housing starts in 2011 was 23,999. Additionally, Enbridge noted that the higher metric targets (44% – 56% higher than 2010) were too aggressive for this relatively young program. Further, in reviewing its internal procedures, Enbridge noted a discrepancy in the number of units installed vs. the number shipped. According to research done internally by Enbridge, the 4,052 DWHR units that had previously been claimed by

Enbridge in their 2011 annual report included approximately 334 units that were shipped in 2011 but installed in 2012, approximately 867 units that were shipped in 2011 and have yet to be installed, and approximately 771 units that were carried over from the 2011 program tracker and shipped in 2012. This discrepancy resulted in a significant reduction in the number of drain water heat recovery unit installations attributable to Enbridge's programs in 2011, down from 4,052 units to 2,168 units. The updated SSM calculation is shown in Table 2-10.

Table 2-10. DWHR Market Transformation Scorecard from 2011 Audit

Drain Water Heat Recovery		2011 Metric Value Levels			Weight	2011 Metric Value Actual Results	SSM Achievable at 100%	SSM Achieved
Element	Metrics	50%	100%	150%				
Ultimate outcomes	Units installed (new buildings) as percentage of housing starts (across all builders)	4,800	5,280	6,000	/80	2,168	$520,000	$117,438
Program performance	First-time new builders enrolled (incremental)	20	25	30	/20	60	$130,000	$195,000
Total								**$312,438**

There was no verification report for the DWHR market transformation program. Should a verification effort similar to the one implemented for the TAPs residential program have been implemented, it is possible that the error noted above would have been caught in the audit process. Under the current audit process, a review of the participant count and tracking procedures was not performed for this program. 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. The auditors examined the scorecard calculations as described. The participant counts were reported by Enbridge and review of the participant tracking was not in the scope of the audit. Given the updated participant counts provided by Enbridge, the auditor believes that the reported SSM is reasonable and appropriate.

2.5. Low Income Weatherization Program Scorecard

Enbridge implemented a low-income weatherization program during the 2011 program year. The goals of this program were to reduce energy consumption through an improved building envelope. The program's target market was low-income customers. Table 2-11 summarizes the low-income weatherization program scorecard, including the 2011 outcomes and the resulting SSM attributable to the program.

Table 2-11. Low-Income Weatherization Program Scorecard

Low-Income Weatherization		2011 Metric Value Levels			Weight	2011 Metric Value Actual Results	SSM Achievable at 100%	SSM Achieved
Element	Metrics	50%	100%	150%				
Ultimate outcomes	Weatherization participants	400	500	575	/50	599	$200,000	$300,000
Program performance	Total natural gas savings (m3)	615,100	773,650	894,950	/50	824,773	$200,000	$242,146
Total								**$572,146**

Enbridge met or exceeded its 2011 targets for the low-income weatherization program. Enbridge attributed the success of this program to expanded program penetration into new communities and to more comprehensive program delivery as a result of the lower TRC threshold (reduced from 1 to 0.7 for this program).

The auditor reviewed the results reported by Enbridge for the 2011 low-income weatherization program and found the actual 2011 results and resulting SSM to be accurate.

3. CALCULATIONS AUDIT

The auditors reviewed the three calculation mechanisms in detail. In summary, no errors were found and all calculations produced the intended results.

3.1. Shared Savings Mechanism Calculations

The auditor reviewed the SSM and TRC calculation methods applied in the 2011 Annual Report[11] and found the calculations to be accurate and in accordance with OEB guidelines. The final TRC values were updated by auditors to reflect the changes they made in their review of the 2011 program results. The final TRC values are shown in Table 3-1.

Table 3-1. Enbridge Annual Report and Audited TRC Values

Shared Savings Mechanism, by Program Area	2011 Draft Annual Report TRC ($)	Audit Adjusted TRC ($)	Difference in TRC = Audited TRC - 2011 Annual Report TRC ($)
Existing Homes	$48,867,106	$48,461,257	-$405,849
Residential New Construction	$1,125,396	$1,125,396	$0
Low Income	$422,179	$423,000	$822
Total Residential	**$50,414,681**	**$50,009,653**	**-$405,027**
Commercial Prescriptive	$12,666,641	$12,666,641	$0
Commercial Custom	$35,042,436	$34,312,086	-$730,350
Multi Residential	$43,377,882	$42,760,257	-$617,626
Large New Construction	$9,835,906	$9,422,226	-$413,680
Industrial	$27,895,220	$28,712,958	$817,738
Total Business Markets	**$128,818,086**	**$127,874,167**	**-$943,918**
NPDC	-$124,960	-$124,960	$0
Overheads	-$5,988,693	-$5,988,693	$0
Total All Programs	**$173,119,113**	**$171,770,167**	**-$1,348,946**

[11] Appendix D illustrates the flow of data within the TRC workbook.

The audited TRC result was entered into the SSM calculation, and the resulting resource acquisition (RA) program SSM values were updated. The Drain Water Heat Recovery (DWHR) Market Transformation (MT) program scorecard and the Low Income (LI) Weatherization program scorecards were reviewed, and the adjusted SSM values from these programs were entered into the final SSM calculation. The audited RA, MT, and LI weatherization program SSM results are shown in Table 3-2.

Table 3-2. Draft Report and Audited RA, MT, and LI Weatherization Program Shared Savings Mechanism Results

Shared Savings Mechanism	2011 Draft Annual Report Value ($)	Audit Adjusted Value ($)	Difference = Audited SSM - 2011 Annual Report SSM ($)
2011 Resource Acquisition SSM	$5,911,273	$5,834,044	-$77,229
2011 Market Transformation Scorecard SSM	$414,492	$312,438	-$102,054
2011 Low Income Scorecard SSM	$542,146	$542,146	$0
Total	**$6,867,911**	**$6,688,629**	**-$179,283**

The audited SSM was 2.6% less than the value reported in Enbridge's 2011 Annual Report. The primary reason for this deviation was the error in the tracking of the installed DWHR units.

The auditors reviewed the TRC and SSM calculations and found the methods applied to calculate these values were accurate and in accordance with OEB guidelines. Applying the reviewed TRC and SSM calculation methods, the TRC and SSM values were updated to reflect the adjustments to the resource acquisition and market transformation program results discussed previously in this report. The resulting audited SSM is $6,688,629.

3.2. Demand Side Management Variance Account

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 2011 Annual Plan, filed on May 28, 2010 established a 2011 DSM budget of $26,708,068; this was the budget built into rates. As per the OEB's September 24, 2010 request, Enbridge filed an amended Low Income Weatherization Plan on November 11, 2011 that proposed an additional $1,366,375 for low income programs. Enbridge's Low Income Weatherization Plan amendment was approved by the Board on December 20, 2010. The total 2011 Board-approved program budget was $28,074,443. The initial $26,708,068 budget was built into rates; the additional $1,366,375 was not.

Enbridge's total 2011 spending was $27,243,872. Of this, $26,708,068 was built into rates, resulting in a variance of $535,804, as demonstrated in Table 3-3. The auditors reviewed Enbridge's 2011

Annual Plan, with updates[12], which included the $26,708,068 budget that was built into rates and the $1,366,375 budget that was approved in the Amended Low Income Weatherization Plan, but was not built into Enbridge's 2011 rates. The review did not include auditing of Enbridge spending documentation. This is a financial auditor's responsibility. Auditors assumed the spending to be correct. fThe auditors also reviewed the calculation of the 2011 DSMVA and discussed the reported spending with Enbridge staff to verify the accuracy of the DSMVA calculation and ensure consistency between the spending reported in the DSMVA calculation and the 2011 TRC calculation. The auditors' review of the 2011 spending calculation showed that although Enbridge underspent the budget that agreed upon with the Board in Enbridge's amended 2011 Annual Plan, Enbridge was entitled to collect money from the ratepayers via the DSMVA to recover the $535,804 of spending that was not built into the 2011 rates.

Table 3-3. Enbridge Draft Report and Audited DSMVA

DSMVA	2011 Annual Report Value ($)	Audit Adjusted Value ($)
Total 2011 DSM Budget as per 2011 Annual Plan, with updates	**$28,074,443**	**$28,074,443**
Additional 2011 DSM Budget, not included in rates, as per amendment to 2011 Annual Plan, approved by OEB on December 20, 2010	$1,366,375	$1,366,375
Portion of Budget from 2011 Annual Plan included in rates, submitted to OEB on May 28, 2010	**$26,708,068**	**$26,708,068**
Total 2011 Enbridge DSM Program Spending	$27,243,872	$27,243,872
2011 DSMVA	**$535,804**	**$535,804**

The auditors reviewed the DSMVA calculation in the draft of the 2011 Draft Annual Report and found that the calculation and inputs are accurate. The DSMVA recoverable from ratepayers to Enbridge is $535,804.

3.3. Lost Revenue Adjustment Mechanism

The LRAM serves as a self-correcting balancing account to ensure the interests of stockholders 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

[12] Enbridge's 2011 Annual Plan is detailed in Ontario Energy Board filing EB-2010-0175. This filing includes the original 2011 Annual Plan, which details the budget that was built into rates, and the Amended Low Income Weatherization Plan.

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.[13]

Rate adjustments for rates 1 and 6 are not included in the 2011 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. Enbridge's 2011 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 2011 Annual 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)	2011 LRAM ($)
Rate 110	1,995,809	973,689	-1,022,121	1.63	-$16,612
Rate 115	1,270,060	835,294	-434,767	0.99	-$4,309
Rate 135	0	178,224	178,224	1.40	-$2,495
Rate 145	1,863,650	730,207	-1,133,443	1.81	-$20,522
Rate 170	4,329,389	1,392,187	-2,937,203	0.57	-$16,671
2011 LRAM	**9,458,908**	**4,109,601**	**-5,349,310**	**1.04**	**-$55,619**

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 2011 rates. The audited LRAM is shown in Table 3-5.

[13] "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.

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)	2011 LRAM ($)
Rate 110	1,995,809	995,813	-999,996	1.63	-$16,252
Rate 115	1,270,060	845,723	-424,337	0.99	-$4,206
Rate 135	0	182,436	182,436	1.40	$2,554
Rate 145	1,863,650	726,920	-1,136,730	1.81	-$20,582
Rate 170	4,329,389	1,436,536	-2,892,854	0.57	-$16,420
2011 LRAM	**9,458,909**	**4,187,428**	**-5,271,481**	**$1.04**	**-$54,905**

Enbridge is recalculating the LRAM results using the "long form" method. The long form results may deviate slightly (expected to be less than $500) from the above. Enbridge will update the LRAM results if necessary in the audit summary report.

4. FINDINGS AND RECOMMENDATIONS

ERS has audited Enbridge's 2011 and 2012 reports associated with their 2011 program reporting and performance. In aggregate, the audit uncovered few elements requiring adjustment. Those adjustments collectively were small relative to Enbridge's total savings, TRC, and payment mechanism results as reported in their May 2012 Annual Report. ERS recalculated all results with audited adjustments.

We have audited Enbridge's Annual Report, TRC savings, SSM, LRAM and DSMVA for the calendar year ending December 31, 2011. The Annual Report and the calculations of TRC, 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 OEB in its Decision with Reasons dated August 6, 2006 in EB-2006-0021. Details of the steps taken in this audit process are set forth in the audit work plan provided in Appendix A, and this opinion is subject to the details and explanations herein 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 forth by the OEB that are applicable to the 2011 DSM programs of Enbridge:

- TRC savings – $171,770,167
- SSM amount recoverable – $6,688,629
- LRAM amount recoverable – -$54,905
- DSMVA amount recoverable – $535,804

For comparison, the draft values previously reported by Enbridge for 2011[14] were:

- TRC savings – $173,119,113
- SSM amount recoverable – $6,867,911
- LRAM amount recoverable – -$55,619
- DSMVA amount recoverable – $535,804

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. Custom

1. **Finding.** The Enbridge independent review protocols of verification without post-retrofit measurement of equipment performance over time limits the scope of reviews to detection of

[14] All values from *Demand Side Management 2011 Draft DSM Annual Report*, Enbridge Gas Distribution Inc., DSM Research and Evaluation, April, 2012 (SSM amounts combined for resource acquisition and scorecard programs) except LRAM, which is from 2011 FE-PE_Actual vs Budget_LRAM_Audit_Step 4_May 15.xlsx, provided to ERS from Corrie Morton, Enbridge DSM Research and Evaluation, May 22, 2012.

errors, fraud, and determination of "reasonableness" of savings predictions, but cannot truly validate savings.

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.

2. **Finding**. Enbridge does not collect custom project analysis data in its MS Excel workbook or other native format. This limits the ability of the verification and audit contractors to efficiently and effectively review prior work.

   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.

3. **Finding**. The custom program verification studies calculate the overall adjustment factor by computing the weighted average factor for the sample projects, with the weighting based on energy savings. The weighted average also should account for the differing expansion weights associated with each project.

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

4. **Finding**. The verification studies do not report the actual error ratio, which could be used in the next year's design.

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.

5. **Finding:** Final project cost was not well documented. Though some form of final project documentation existed in each case, it was often informal consisting of an email from the participant to EGD or a quote (issued before the project, as opposed to an invoice) without final cost reconciliation.

   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.

4.2. Prescriptive

1. **Finding.** For the Partners, Low Income Partners, and Multi-Residential programs, Enbridge differentiated savings attributed to showerheads depending upon the flow rate of the pre-existing showerheads. The percentage of overall participants in each of two flow rate categories is based on documented pre-installation bag test data reported by the installing contractors. Multi-Residential Program showerhead reported savings implies that 59.4% of the participants had pre-existing showerheads with flow greater than 2.5 gpm.

   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.

2. **Finding.** For pre-rinse spray valves Enbridge used the same overall reported 33.3% remain-in-place value for all three foodservice facility types (full service, limited duty, and other). It is likely that the retention rate varies by facility type.

   Recommendation. If this offering continues, either reanalyze existing data or collect new data in the next round of evaluation to test whether retention rates vary by facility type and use different values if the difference is material.

3. **Finding.** The residential verification reports were inconsistent in their presentation of the percentage of units distributed, percentage of units installed, and percentage of units remaining after removal. These inconsistencies led to errors in the calculation of residential program adjustment factors.

   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.

4.3. Market Transformation

1. **Finding.** In reviewing its internal procedures, Enbridge noted a discrepancy in the number of DWHR units installed vs. shipped. This discrepancy resulted in a decrease in the SSM for this market transformation program. There was no verification report for the DWHR market transformation program. Should a verification effort similar to the one implemented for the TAPs residential program have been implemented, it is possible that the error noted above would have been caught in the audit process. Under the current audit process, a review of the participant count and tracking procedures was not performed for this program.

   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.

4.4. General

1. **Finding.** The free-ridership estimates are quite dated. The prior audit report recommended new research to update these estimates. This is not critical for low income programs, which typically have low free ridership, but is important for the custom programs. For example, auditors noted that participants installed a significant number of the custom projects prior to the submitting incentive applications. This could mean that customers decided to implement projects before seeking incentives. Enbridge reports that is common for them to be engaged with customers long before receiving an application, and of course the expectation of incentives can influence decision-making well before paper trails demonstrate linkage. Nonetheless, this could be an indicator of free ridership. This is a subject that will be discussed by the newly formed Technical Evaluation Committee (TEC).

   Recommendation. Prioritize and complete free ridership research in 2012 for completion prior to next year's analysis.

2. **Finding.** Spillover is not considered in the TRC reports. While it is possible that this factor is small, it been found to be material in some jurisdictions.

   Recommendation. Consider incorporating spillover research with the free ridership decision-making data collection. Absent comprehensive study, targeted inquiry regarding spillover by residential contractors and large C/I participants and suppliers are more likely than with other entities.

3. **Finding.** This audit did not include "depth" investigation of any data transfer protocols or DARTS processing. During the audit Enbridge discovered substantive tracking errors related to residential drain water heat recovery installation rates that the audit did not and would never have uncovered without Enbridge direction.

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

Appendix A:

Independent Audit of Enbridge Gas Distribution 2011 DSM Program Results, Final Work Plan

Independent Audit of
Enbridge Gas Distribution
2011 DSM Program Results
Final Work Plan

energy & resource
solutions

120 Water Street, Suite 350
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May 20, 2012

Contents

Work Plan for Independent Audit of Enbridge Gas Distribution 2011 DSM Program Results

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 Evaluation and Audit Committee 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 Total Resource Cost (TRC) savings, the Shared Savings Mechanism (SSM), the Lost Revenue Adjustment Mechanism (LRAM) and the Demand Side Management Variance Account (DSMVA) for the calendar year ended December 31, 2011 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 August 6, 2006 in EB-2006-0021.

ERS will perform the audit according to seven tasks as described in this work plan.

Task 1: Kick-Off

The audit started with Enbridge delivering the first of multiple sets of program files to ERS on March 26. ERS joined the Evaluation and Audit Committee (EAC) for their weekly teleconference calls starting on April 4. The EAC and ERS are using a portion of the time in this regular teleconference to help ERS gain familiarity with Enbridge's programs and historical context.

ERS will meet in person with Enbridge staff at their offices on April 24th and 25th, 2012 to review information and materials collected to date, solicit additional input, identify key issues, and discuss any uncertainties that may affect the audit. Specifically, ERS will interview evaluation and program administration staff to learn:

- How the programs work
- Topics that the program administrators would like ERS to investigate
- Database, workbook and E-Tools orientation
- Lessons learned from prior audits

ERS will meet with the EAC regarding:

- EAC and other stakeholder comments to the annual DSM report
- Other background information the EAC feels the auditor should know.

ERS then will:

- Present this work plan, and refine it with EAC members
- Discuss early findings and topics being investigated
- Present questions for further investigation

The conclusion of in-person meetings will signify the end of the kick-off phase of the audit.

Task 2: Review Program-Related Material and Documentation

ERS will gather information during Task 1 Kick-Off and will continue to assemble documentation throughout the first month of the audit as part of Task 2. ERS already has received or anticipates receiving and reviewing at least the following material:

- ❑ Year-end custom commercial and industrial program reports
  - o 2011 Custom Commercial Year End Report
  - o 2011 Custom Industrial Year End Report
  - o 2011 Custom Commercial and Industrial population records
  - o 2011 Sampling workbooks completed to select projects for the program review
  - o 2008 Sampling methodology guidance documents
- ❑ Year-end residential program reports
  - o 2011 Regular TAPS Year End Report
  - o 2011 Low Income TAPS Year End Report
  - o 2011 TAPS Kit Direct Response Research Report
  - o 2011 TAPS Reduction Factors Spreadsheet
- ❑ Research reports
  - o Showerhead Verification Research for Multi-Residential Rental Market

- Pre-Rinse Spray Valve (PRSV) Verification Research

- TRC documents, records, screening tools, and calculations
  - 2011 TRC Results SSM Workbook
  - 2011 TRC plan
  - LRAM calculations workbook
- Enbridge's DSM Annual Report for 2011, including comments of the EAC 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
  - EGDI DSM Plan
  - EGDI Low Income DSM Plan
  - EGDI Updated DSM Measures List (savings basis)
- Prior audit reports and recommendations
  - 2010 Audit Report
  - 2009 Audit Report
- Data tracking records and documents such as completed prescriptive forms and back-up documentation.

While not a direct subject of the audit, ERS also will review the prior year high efficiency boiler and steam trap research reports. 2011 research and verification activities do not address the prescriptive (small) commercial program except for the pre-rinse spray valve measure research report. Low income weatherization program review is not in scope.

Task 2 is primarily a survey and data collection exercise. ERS will review the orders and plans for policy purposes, and will read the pre-2011 reports for context. In-depth review of the 2011 program and research reports is part of Tasks 3 and 4.

The document collection and review process started April 1 and will continue through May 14.

Task 3: Review Custom Project Files and Engineering Records

Enbridge contributed funding for 141 custom industrial projects and 960 custom commercial projects in 2011. Each project required engineering analysis to develop unique savings estimates.

The verification process included intensive review of a sample of the projects. Enbridge hired an analytical firm to execute a standardized sample design procedure and select projects

for verification. The contractor selected 15 industrial projects and 26 commercial projects. [1] Enbridge then hired two engineering firms to independently verify savings associated with the sampled projects and develop representative custom commercial and custom industrial savings realization rates for Enbridge to apply to all custom projects in Total Resource Cost (TRC) calculations. The verification procedure included review of applicant calculations and a site visit to inspect the installed equipment and interview participants.

ERS selected a sub-sample of 12 projects from the verification samples to audit. The selection process assigned separate strata for industrial, agricultural, commercial/multi-residential retrofit, and commercial/multi-residential new construction, and made census selections of projects exceeding one million m^3 reported savings. While statistically structured, the selection was not intended to be an optimized design. It does ensure representation of each customer type and includes projects both with and without water savings, both with large and small reported savings, and with a broad distribution of energy efficiency technologies. The audit subsample accounts for 68% of the verification sample's total annual natural gas savings.

ERS will review a sufficient number of projects to be able to either confidently conclude that the verification-based realization rates are reasonable and unbiased, or to develop an audit-based alternate realization rate. ERS has requested and received information associated with twelve projects. After preliminarily reviewing all twelve projects and intensively reviewing nominally four of them, ERS will report to the EAC on the findings to date and estimate the total number of reviews necessary to make one of the two conclusions.[2] . The review will consist of:

1. **File review** – Our team will perform a thorough review of the project files and third-party reviews. ERS will utilize a checklist to allowing systematic determination of whether or not key project elements have been reported and are well documented. It will include checks for validity of baseline characterization, weather normalization, and operating hours, among other technical parameters. Any data, assumptions, or calculations considered less than reliable will be recorded for follow-up.
2. **Third-party reviewer interviews** – When project file reviews raise accuracy or reliability questions that document review alone cannot resolve, the lead audit

[1] The custom commercial category includes both commercial and multi-residential facilities, and both retrofit and new construction projects. The custom industrial category includes both industrial and agricultural projects.

[2] The final count may be greater or lesser than the nominal count of twelve budgeted. Due to the limitations inherent in desk review-based review, the audit-based realization rate, if necessary, will have a relatively high and unknown degree of measurement uncertainty.

engineer will engage the project reviewer and discuss the process utilized to calculate savings. The results of these discussions will be reported.

3. **Project site visits** – Site visits will not generally be in scope. If there are extenuating circumstances where ERS feels a site visit is necessary to resolve discrepancies ERS will consult with the EAC and if budget and schedule allow, make such arrangements.

ERS will quantitatively review the projects to:

- Determine if projects were categorized appropriately when distinguishing between "advancement" and "replacement" measures or projects;
- Review incremental cost estimates;
- Assess or independently calculate energy and water impact; and
- Review measure life for reasonableness.

If ERS believes a different savings estimate is more appropriate for a reviewed project in the sub-sample, analysts will adjust the inputs for the TRC analysis at least for that project and as a statistically representative correction to the sub-sample, sample, or population as appropriate.

After individual project reviews are completed, the auditors will assess whether or not the M&V contractors' method of aggregating results complies with industry accepted protocols, and will identify any areas of concern with respect to Enbridge's TRC calculations and assumptions for custom projects. Where appropriate, ERS will recommend improvements to Enbridge's reporting processes.

Task 4: Review Prescriptive and Quasi-Prescriptive Program Reports and Research Reports

Enbridge and its contractors completed program reports on the three residential TAPS programs (regular, low income, and direct mail) and completed two research reports on specific measures. ERS will audit the reports for validity, comprehensiveness of analysis, to ensure they reflect OEB guidance and incorporate the most recent recommendations. ERS will trace the results including the reduction factors from these reports to the master TRC workbook.

ERS will review the EGDI Updated DSM Measures List (savings basis) submitted to the OEB that is the basis for a significant portion of the prescriptive savings, but the review will not be intensive, as this document already has been reviewed by multiple parties including those independent of Enbridge. Our examination of the accepted substantiation sheets and Enbridge's measure database will be improved with interviews with program managers and

implementation staff both during the scheduled in-person meetings and afterwards via telephone.

As noted above, 2011 research and verification activities do not address the prescriptive (small) commercial program savings beyond the pre-rinse spray valve measure research report and the updated measures list. In 2009 and 2010 research reports have examined two other major sets of measures: high efficiency boilers and steam trap leak reduction measures. ERS will consider the appropriateness of the scope of the 2011 research and program reports in the context of research reports completed in recent years prior to 2011.

If errors are found for which ERS can recalculate savings directly, the engineer will do so as part of the audit. If errors are found that require Enbridge or contractor involvement, ERS will provide information on the requested change to Enbridge for recalculation.

ERS will note future opportunities to improve the impact estimates and areas of interest for later evaluation research.

Task 5: Data Tracking and TRC System Review

The results produced in the documents audited in Tasks 3 and 4 are inputs to the TRC master workbook. ERS will audit the 2011 TRC calculation workbook to determine if

1. The TRC workbook received the correct data inputs from the annual program and research reports,
2. The TRC calculations are correct and comply with OEB guidelines and other relevant guidance documents, and
3. The results are properly reflected in Enbridge's annual report.

ERS's TRC review will focus on the parameters that affect the TRC including measure unit savings from the substantiation sheets, program gross savings, evaluated measure retention, measure life, free ridership, and data transcription errors.

During the ERS in-person visit ERS will review the data management protocols that lead to the data generated for the TRC workbook inputs via in-person interviews. ERS will also learn how personnel process exceptions and whether such exceptions represent a significant proportion of claimed energy savings or project costs. In-depth examination of DSM Analysis, Reporting, and Tracking System (DARTS) and other similar tools is not in scope.

If auditors discover inaccuracies, data entry errors or untenable assumptions, he or she will highlight these discrepancies and then recalculate the net impacts of our recommended adjustments on the TRC savings value. If the auditor cannot perform the recalculation alone with confidence, ERS will work with Enbridge to do so.

Having completed the above-noted reviews, our team will provide an opinion regarding the accuracy and defensibility of the data supplied to and calculations executed by the TRC calculator.

Task 6: Performance-Based Account Review

The three subsections below describe how ERS will audit the three sets of calculations required to compute shared savings, the lost revenue adjustment, and reconciliation of the DSM variance account.

Shared Savings Mechanism (SSM)

Shared Savings Mechanism calculations are incorporated into the master TRC workbook. ERS will verify that the shared savings calculation for the 2011 program year is consistent with OEB-approved methodologies and that variables affecting claimed TRC savings values, and thus the SSM, reflect reasonable assumptions. Should auditors discover any deviations from OEB-approved or industry-accepted methodologies, ERS will recommend appropriate revisions and recalculate the SSM based on adjusted TRC savings values. Also, ERS will make any relevant recommendation to Enbridge's processes so that future SSM adjustments would be unnecessary.

Lost Revenue Adjustment Mechanism (LRAM)

Under this subtask, ERS's objectives are two-fold:

First and primarily, ERS will determine whether the methodologies and assumptions used to calculate the actual LRAM savings volume, net of installed efficiency measures, (i.e., ex post) are consistent with the methodologies and assumptions used to calculate the year's LRAM savings volume (i.e., ex ante). ERS will ensure that the net volumetric savings are appropriately allocated to each respective customer class. The results will determine whether Enbridge has under- or over-collected lost revenues based on the difference, if any, between forecasted sales volume and actual sales volume.

Second, ERS will point out opportunities discovered in the course of the audit that will result in value-added enhancements to the assumptions Enbridge operates under for further study in subsequent program evaluations.

Demand Side Management Variance Account (DSMVA)

ERS will examine the procedures and processes resulting in the collection of funds into the DSMVA and determine if these procedures and processes are correct by determining if:

1. The documented budgeted funding reflects that approved in the 2011 DSM plan, plus any relevant subsequent modifications, specifically the December 20, 2010 OEB approval of added funding;
2. The documented actual expenditures reflect the amounts generated by the financial accounting system cost outputs and are in the TRC workbook; and
3. The DSMVA calculations are correct and reflect the most current OEB guidelines.

If errors or inconsistency are uncovered, ERS will recommend modification of the DSMVA calculation and note the impact, if any, that such a modification has on the Enbridge's request to clear this account.

Task 7: Issue Draft and Final Reports

Upon completion of Tasks 1 through 6, ERS will be able either to render the independent opinion that the TRC, SRM, LRAM, 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, Total Resource Cost (TRC) savings, Shared Savings Mechanism (SSM), Lost Revenue Adjustment Mechanism (LRAM) and Demand Side Management Variance Account (DSMVA) of Enbridge Gas Distribution for the calendar year ended December 31, 2011. The Annual Report, and the calculations of TRC, 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 its Decision with Reasons dated August 6, 2006 in EB-2006-0021. 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 2011 DSM programs of Enbridge Gas Distribution:*
>
> *TRC Savings - $xxx,xxx,xxx*
> *SSM Amount Recoverable - $x,xxx,xxx*
> *LRAM 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 May 25. Subsequent to our review meeting with the EAC on June 7, ERS will issue a final report by June 20, 2012 incorporating the input of the EAC.

The draft report will be formally presented by key ERS team members at a meeting with Enbridge and its stakeholders. ERS expects that this comprehensive review process will identify points needing clarification or correction. Assuming agreements have been reached with respect to any corrections and clarification, a second report will be drafted and submitted to stakeholders for review and comment.

Once draft audit reports have been fully reviewed, a final audit report will be submitted. The final report will provide an accurate and defensible independent opinion as to the reasonableness and accuracy of Enbridge's claims regarding the SSM, LRAM, and DSMVA. Enbridge will be able to confidently use the audit as evidence to clear the relevant DSM accounts.

Schedule

Key tasks and proposed completion dates are provided in Table 1-1, below.

Table 1-1 Key Task Schedule

Activity Description	Associated Task	April	May	June
Progress meetings w/EAC - conference calls	1	Weekly		
Program material review	2	4/1 to 5/14		
Custom sub-sample data request	3	4/10		
Custom project engineering reviews	3	4/12 to 5/14		
Draft work plan submission	1	4/19		
Work plan review with EAC	1	4/20		
Enbridge program orientation for auditors (in-person)	1	4/24		
Enbridge data systems orientation (in-person)	1	4/24 - 4/25		
Auditor presents preliminary findings/exploration topics	1	4/25		
Finalize work plan	1		5/2	
Data tracking and TRC system review	5	4/12 - 5/21		
Performance-based account review	6	4/12 - 5/21		
Review non-custom program reports	4	4/26 - 5/16		
Review measure research reports and updated measure list	4	4/26 - 5/16		
Draft audit report with findings and recommendations #1	7		5/25	
Review meeting w/EAC	7			6/7
Draft audit report #2	7			6/13
Review meeting w/EAC	7			6/20
Final report submitted	7			6/28

Appendix B:

CUSTOM PROJECT REVIEW SUMMARIES

AND

EXAMPLE
SITE-SPECIFIC CUSTOM PROJECT AUDIT CHECKLIST

NC.011.11. This was a new construction project at an 8,743 m^2 facility for medical patients and their families. The project was modeled using EE4 software and was signed and stamped by a professional engineer. A detailed narrative describing the modeling approach was included in the project file along with some of the output sheets from the EE4 software. The scope of the verification effort did not allow for parallel modeling as a method for confirming savings. The savings were reviewed on a system-by-system basis with the information provided in order to determine if the order of magnitude of savings was reasonable given the stated measures and inputs. The 2011 evaluator noted that the base-case insulation levels did meet MNECB but did not meet OBC 2006, which was the mandatory baseline for this project. The evaluator lowered the gas savings estimate due to the increased insulation requirements of the OBC 2006 baseline. The revision was also reviewed and found to be reasonable. The evaluator did not, however, consider the impact on space cooling from the increased base-case insulation. The same base-case improvement factor used to revise base-case gas use was applied to base-case electrical use for cooling to determine the final kWh savings. The auditors agree with the 2011 verification savings as the final gas savings and the auditor has adjusted the kWh savings downward. The filed costs and measure life were found to be reasonable.

NC.007.11. This was a new construction project consisting of 24,581 m^2 of student housing. The project was modeled using EE4 software. A narrative describing the modeling approach was included in the project file along with some of the output sheets from the EE4 software. The scope of the verification effort did not allow for parallel modeling as a method for confirming savings. The savings were reviewed on a system-by-system basis with the information provided in order to determine if the order of magnitude of savings was reasonable given the stated measures and inputs. The claimed savings for the project has been split between Enbridge and OPA. There are both electrical and gas savings associated with this project, with gas savings accounting for approximately 60% of the total and electric savings accounting for 40%. The allocation of gas and electric savings between Enbridge and OPA was made in a fashion that Enbridge reports does not allow double counting.[1] The audit accepts the 2011 evaluator savings, which are unadjusted from the original filed amount, as a reasonable estimate of savings and also found the filed costs and measure life reasonable.

If the project savings had been allocated according to the 2012 policy, which assigns all gas savings to the gas utility and all electric savings to the electric utility, then the Enbridge TRC for this project would decrease from $437,445 to $152,730.

[1] Ontario Energy Board Decision with Reasons, August 25, 2006, addresses allocation of savings resulting from projects in which both Enbridge and OPA have a role. It states that all savings associated with programs for which a single utility initiated the partnership or program or for which a single entity entirely funded or implemented it is to be considered to have "centrality" and the central utility must be assigned all savings. If centrality is not demonstrated, a program may be considered a partnership. A partnership program is conceived and delivered by both utility companies. For partnership programs, allocation of savings is to be gas savings to the gas utility and electric savings to the electric utility. Enbridge contends that this project's savings is not provided under either a centrality or partnership program. Enbridge and OPA contractually agreed to an alternate savings allocation basis. Auditors do not express an opinion on this interpretation of allocation with respect to Board policy. This distinction is irrelevant to future operations as new Board policy dictates that all program savings be allocated as described in this note for partnership programs.

NP.085.11. The application for this project listed one measure: the installation of insulation on a make-up air unit; no additional information was provided on the nature of the baseline insulation, the proposed insulation, or the operational details of the unit. Extensive pre- and post-install daily gas use data was provided. The metered data demonstrated annual gas savings of 21,858 m^3. The 2011 evaluator reviewed the findings and noted that the level of savings suggested by the metering could not be achieved through the addition of insulation to a make-up air unit alone. The auditors reviewed the theoretical savings that could be reasonably achieved through MAU insulation and agreed conceptually with the evaluators that the demonstrated level of savings could not be achieved through this single measure alone.

Discussions with Enbridge staff revealed that this project should have been categorized as an Ongoing Improvements project through Enbridge's Run It Right program. Enbridge was also able to obtain additional information on the measures implemented at the site. In addition to MAU insulation, improvements were made to dampers, fans, and burners, and boiler setpoints were adjusted. The pre- and post-install metered data was analyzed by both by Yorkland Controls and Enbridge, and the two savings figures were within 4% of one another. While the single insulation measure described in the file and reviewed by the verification firm could not save the filed amount, the overall project was more comprehensive than described and the filed amount is a fair reflection of the project savings. The auditors changed the savings back to the filed amount.

The TRC workbook currently uses a 15-year measure life for all costs and savings associated with this project. Per EGD, the project is to be removed from the C/I capital projects portfolio and placed into the ongoing improvements Run It Right portfolio. A revised TRC was prepared by EGD using the Yorkland Controls' savings, the full project cost, and a 5-year measure life. The audit accepts Yorkland Controls' savings value as a reasonable reflection of savings and also finds the filed costs reasonable. The audit splits the project into two measures in the TRC workbook. One measure is insulation for the make-up air unit, at the originally estimated savings, cost, and 15-year measure life. The second is all other measures, at the originally estimated savings and cost, and a 5-year measure life. The result was an increase in project TRC from -$2,546 to $9,640.

MULTI-PRIV.322.11. This project consisted of the replacement of the existing lead boilers and the addition of a variable frequency drive (VFD) to an existing air handling unit (AHU) to allow for setback of ventilation rates. The savings analysis was conducted with Enbridge's e-tools software. The proposed savings were reviewed with the information provided in order to determine if the order of magnitude of savings was reasonable given the stated measures and inputs. The audit accepts the 2011 evaluator savings, which are unadjusted from the original filed amount, as a reasonable estimate of savings and also found the filed costs and measure life reasonable.

MULTI-PRIV.192.11. This project consisted of the replacement of the existing boilers serving hydronic heating elements throughout the building. The savings analysis was conducted with Enbridge's e-tools software. The proposed savings were reviewed with the information provided in order to determine if the order of magnitude of savings was reasonable given the stated measures and inputs. Two project costs are listed in the provided email correspondence: $52,000 and $55,000. This project was reviewed with consideration to incremental cost, however, not total project cost. The incremental cost in both cases was listed as $20,000. Enbridge should consider revising the TRC to reflect the revised project cost of $55,000, although this will not affect the output of the TRC, as the TRC is based on the correct incremental cost of $20,000. The audit

accepts the 2011 evaluator savings, which are unadjusted from the original filed amount, as a reasonable estimate of savings and also found the filed costs and measure life reasonable.

OTHER.059.11[2]. This project consisted of the replacement and installation of conventional and condensing boiler economizers. Enbridge engineering staff conducted extensive on-site testing of the existing boilers and developed the savings estimate based on these values and detailed spreadsheet analysis. The evaluator's spot observations of economizer exit temperatures found that they were close to the values used in the calculations, an indicator of reasonable savings estimation. The evaluator also noted that the kWh savings associated with VFDs on draft fans needed to be revised as the base case assumed the presence of draft fans that did not exist. Enbridge's analysis represents a significant engineering effort. The audit accepts the 2011 evaluator savings, which were adjusted downward 11% from the original filed amount, as a reasonable estimate of savings and also found the filed costs and measure life reasonable.

AGR.003.11. This project proposed the installation of a horizontal energy curtain over a portion of the greenhouse facility. This curtain will reduce heat loss during nighttime hours. The analysis presented made use an energy model that considered weather data and enclosure performance characteristics. This analysis was supported by a second energy model that was run by the 2011 evaluator. The auditor reviewed the inputs to the models and performed Internet research to verify the enclosure improvements associated with the energy curtain. The audit accepts the 2011 evaluator savings, which are unadjusted from the original filed amount, as a reasonable estimate of savings and also found the filed costs and measure life reasonable.

ALL.015.11. This project included the removal of an existing make-up air unit (MAU) and the installation of eleven unit heaters with thermostats. Removing the MAUs, which draw in 100% outside air, and replacing them with new unit heaters that do not draw in any outside air, reduces the building heating load. The savings were generated through e-tools and account for the ventilation savings associated with the removal of the MAU. The magnitude of the savings was confirmed by the evaluator, who generated an independent analysis of the energy use associated with the decommissioned MAU. It was noted that all the savings have come from the removal of the MAU, with no additional gas use attributed to the new unit heaters. Enbridge engineering staff explained that this was because there was no increase to the heating load due to the removal of the MAU, and the new heaters were installed as a precaution. The same savings should result if the building's heating needs are met by increased use of pre-existing recirculating unit heaters instead of the new heaters because, absent differences in system combustion efficiency, it is the reduction in outside air that drives the savings. The evaluator agreed with this conclusion. The applicant stated that they would not remove the existing MAU without the installation of the new unit heaters. The 2011 evaluator savings are unchanged from the claimed amount and accepted as the final savings.

ALL.046.11. This facility conditions a large amount of outside air that is used in the spray booths. This project reduced the amount of outside air needing to be conditioned by recirculating a portion of the airstream. Significant on-site testing was conducted and is the basis for the savings analysis.

[2] The project application reviewed by the auditor is dated January 12, 2012. The same document notes that the project was completed December 16, 2011. A second Enbridge document, "Energy Efficiency Custom Project Documentation", is dated January 12, 2011 supporting the project as part of 2011 portfolio, though no final invoices were included for review.

The 2011 evaluator confirmed through a site visit that the proposed system was operating as intended. The 2011 evaluator savings are accepted as the final savings.

ALL.034.11. This project proposed the installation of condensing economizers for boilers 1, 2, and 3; the condensing economizers are used to preheat three heat sinks in the facility. Enbridge engineering staff conducted extensive on-site testing and made use of detailed spreadsheet analysis to generate the savings. The 2011 evaluators reviewed the analysis and accepted the approach. During the site visit the 2011 evaluators noted that two issues with existing equipment prevented the facility from capturing and utilizing the anticipated quantities of heat. First, cold air is infiltrating the stack. The lower stack temperature reduces the economizer effectiveness. Less heat can be recovered from the stack than designed. Second, an existing condensate pump had insufficient head to push through the new economizers.

The evaluator noted that that applicant was in the process of troubleshooting and remediating the equipment issues and that the evaluated savings would assume that these deficiencies would be repaired. The evaluator then went on to propose savings based on a simple one-line calculation: multiplying the summer and winter condition heat recovery data from the economizer manufacturer (expressed in Btu/hr) by the summer and winter condition run hours from e-tools. This approach is less rigorous then the original savings calculated by e-tools. The auditor followed up on the status of the two repairs in June and the participant, through Enbridge, indicated that the condensate pump was replaced and that part of the system now is reportedly working as designed. Regarding the undesirable infiltration, plant personnel are scheduled to inspect for this in their July shutdown and will attempt to remedy the issue. More importantly, site staff report that the facility already recovers more heat than can be used. Enbridge reports, and auditors verified, that the e-tools modeled heat load reflects this condition as well, that the load is indeed less than the heat exchanger's design capacity could provide, so this remedy will not affect savings. Accepting that the site will repair the outstanding infiltration issue, the verified savings should be those proposed by Enbridge as they represent a more rigorous analysis. The audited savings are revised to the original Enbridge savings, for a net increase of 12% compared to the verification savings.

ALL.113.11. This project consisted of the expansion and improvement of an evaporation line by adding two additional effects to an existing single effect evaporator. The analysis presented is based on production data, engineering data provided by the manufacturer, and reviews performed by Enbridge staff. The 2011 evaluator reviewed the calculations and accepted the savings. The evaluator's site visit confirmed the installation and noted that the plant had experienced a reduction in energy intensity since implementing the project. The energy intensity values compare site-wide gas use to total production and do not specifically measure the evaporation process contained in this application. Therefore the reduction in measured energy intensity cannot be used to revise savings associated with this measure, but does indicate a general downward trend in energy use. The 2011 evaluator savings are accepted as the final savings.

ALL.041.11. This project proposed replacing existing spray guns with more efficient trigger-actuated spray guns. Additionally a portion of the water used in the spray process will now be recycled, reducing the amount of make-up water that needs to be heated for the process. The evaluator conducted spot verification measurement of key parameters. The typical variability of spray gun flow rates limits the value of spot metering, but the spot correlation is at least reassuring. The analysis is based on straightforward engineering calculations, making use of flow and temperature data as measured and provided by the applicant. The 2011 evaluator reviewed the

general approach and was able to revise slightly the savings estimates based on data collected by the site post install and passed on to the evaluator during their site visit. The 2011 evaluator savings are accepted as the final savings.

Auditor Summary of Enbridge Application Internal Review

Project :	

This section summarizes the information contained in the application documents provided to the Auditor by Enbridge and the Enbridge Internal Reviewers Final Savings

Project File Review Checklist

Project :	
Project Name:	
Reviewer:	Nick Collins
Date:	9-May-12
Application Date:	23-Aug-11
Invoice Date:	None included, email indicates boilers on site before 9/9/11

Brief Project Description

This project proposes the replacement of existing boilers serving hydronic heating elements throughout a multifamily building.

Are there scope revisions?

No

Applicant Savings	Natural Gas	98,814	m^3	annual
	Electricity	-	kWh	annual
	Water	-	m^3	annual

Is the calculation method clear/supported?

The source of the savings value on the application cover sheet (98,814 m^3) is not clear.

The source of EGDs final savings value is clear and supported.

Are key variables identified with clear explanation of their source?

The key variables in EGDs analysis are clear and supported.

EGD Reviewer/Final Savings	Natural Gas	65,799	m^3	annual
	Electricity	-	kWh	annual
	Water	-	m^3	annual

Are the savings revisions clearly explained?

The method and variables used in determining the final EGD savings figure are clear and supported.

				% change
Change in Savings		(33,015)	m^3	-33.41%
		-	kWh	N/A
		-	m^3	N/A

Auditor Review of Evaluation Findings

Project :

This section summarizes the Auditor's review of the Evaluation Firm's findings for this project.

Evaluation File Review Checklist

Did the Evaluator revise EGDs savings?

No

Is the evaluators method clear/supported?

Yes. The evaluator reviewed the supplied ETools output and conducted a site visit to verify installation as per the application. The evaluator also prepared a spreadsheet performing basic checks on the sum of the savings and comparing the energy use to benchmarks.

Are key variables identified with clear explanation of their source?

N/A

EGD Reviewer/Final	Natural Gas	65,799	m^3	annual
	Electricity	-	kWh	annual
	Water	-	m^3	annual
2011 Evaluator Final	Natural Gas	65,799	m^3	annual
	Electricity	-	kWh	annual
	Water	-	m^3	annual
				% change
Change in Savings	Natural Gas	0	m^3	N/A
	Electricity	0	kWh	N/A
	Water	0	m^3	N/A

Applicant Project Cost N.P.

Is the proposed cost clear/supported?

The project cost is for material only and is supported by email correspondence. More recent email correspondence indicates a project cost of $55,000. The incremental cost of $20,000 is based on email correspondence from the contractor quoting the proposed and a standard efficiency option with equivalent capacity. The incremental cost as run in the TRC is $20,000.

Are invoices provided for final project cost?

No

EGD Reviewer proposed cost $52,000.00

Are proposed cost revisions clearly explained?

Email correspondence supports the proposed project and incremental costs

Are Final Invoices supplied?

No

Is the TRC cost re-run with final installed cost?

The TRC is run with an earlier price of $52,000. Later correspondence indicates a cost of $55,000. Either way an incremental cost of $20,000 is proposed and is used in the TRC.

TRC Cost per provided docs

$ 120,019.00 *note TRC at $52,000 project cost, $20,000 incremental

Audit Review Summary

Project :	0	

This section summarizes the recommendations of the Auditor, including any recommended changes to the reported natural gas, electricity, water, and cost impacts for the project.

Audit Review Summary

If no changes to verified results are needed and there is confidence the estimates are reasonable, indicate ("X") and stop. X

Describe why changes are needed or why the auditor lacks confidence in results.

If unable to provide alternate estimate, explain what data would be needed to do so.

Verification Final Savings	Natural Gas	65,799	m^3	annual
	Electricity	-	kWh	annual
	Water	-	m^3	annual
Audit Savings	Natural Gas	65,799	m^3	annual
	Electricity	-	kWh	annual
	Water	0	m^3	annual
				% change
Change in Savings	Natural Gas	-	m^3	N/A
	Electricity	0	kWh	N/A
	Water	0	m^3	N/A

Applicant Project Cost	$55,000	
Audit Revised Cost	$55,000	
		% change
Change in Cost	$0	0.00%
Verified Project Life (years)	25	
Audit Revised Life	25	
		% change
Change in Life	0	0.00%

Appendix C: Aggregate Custom Adjustment Factor Calculations

Table C-1: Custom Sample Design Strata and Weights

Description, N, and n columns from IPSOS email sent 5/21/12.

Stratum	Description	Stratum ID	Total # of Projects (N)	Sample Size (n)	Expansion Weight (N/n)
Industrial Stratum 1	Top Electric Projects	I1	6	5	1.2
Industrial Stratum 2	Top Gas Projects	I2	5	3	1.7
Industrial Stratum 3	Remaining Electricity Projects	I3	14	4	3.5
Industrial Stratum 4	Remaining Gas Projects	I4	63	3	21.0
Commercial Stratum 1	Top Electric Building Renovation	C1	6	3	2.0
Commercial Stratum 2	Building Renovation	C2	160	7	22.9
Commercial Stratum 3	Top Electric Multi-Family	C3	5	3	1.7
Commercial Stratum 4	Multi-Family	C4	428	6	71.3
Commercial Stratum 5	Top Electric New Construction	C5	5	3	1.7
Commercial Stratum 6	New Construction	C6	21	4	5.3

Table C-2: Industrial & Agricultural Results and Adjustment Factors

All data but expansion weight and last row from verification report

Project	Stratum	Expansion Weight	EGD File Savings (m3)	Adjusted Gas Savings (m3)	Adjustment
(a)	(b)	(c)	(d)	(e)	(f)
ALL.015.11	I3	3.5	202,497	202,497	0.0%
ALL.017.11	I2	1.7	794,115	794,115	0.0%
ALL.041.11	I4	21.0	317,068	342,567	8.0%
ALL.028.11	I3	3.5	82,740	82,740	0.0%
ALL.008.11	I1	1.2	479,482	479,482	0.0%
ALL.094.11	I1	1.2	712,617	712,617	0.0%
ALL.045.11	I3	3.5	729,094	729,094	0.0%
ALL.118.11	I4	21.0	170,449	170,449	0.0%
ALL.113.11	I1	1.2	5,633,693	5,633,693	0.0%
ALL.070.11	I1	1.2	913,963	913,963	0.0%
ALL.034.11	I2	1.7	1,557,340	1,438,419	-7.6%
ALL.033.11	I3	3.5	30,319	31,451	3.7%
ALL.046.11	I2	1.7	959,061	959,061	0.0%
ALL.098.11	I1	1.2	41,454	41,454	0.0%
AGR.003.11	I4	21.0	89,728	89,728	0.0%
Total Adjustment without Expansion Weights (1 - Σ col (e) / Σ col (d))					-0.7%
Total Adjustment with Exp. Weights (1 - Σ (col (c)*col (e)) / Σ (col (c)*col (d)))					1.1%

Table C-3: Commercial and Multi-Residential Results and Adjustment Factors

All data but expansion weight and last row from verification report

Project	Stratum	Expansion Weight	EGD File Savings (m3)	Adjusted Gas Savings (m3)	Adjustment
(a)	(b)	(c)	(d)	(e)	(f)
HOS.016	C2	22.9	183,910	183,910	0.0%
NC.013	C6	5.3	111,786	111,786	0.0%
OTHER.044	C2	22.9	10,707	8,030	-25.0%
MULTI-PRIV.192	C4	71.3	65,799	65,799	0.0%
NC.010	C5	1.7	115,909	115,909	0.0%
NC.011	C6	5.3	196,508	189,372	-3.6%
MULTI-PRIV.188	C3	1.7	110,414	110,414	0.0%
MULTI-PRIV.149	C4	71.3	29,877	43,623	46.0%
MULTI-PRIV.108	C4	71.3	71,642	71,642	0.0%
OFF.026	C2	22.9	96,981	96,981	0.0%
SCH.052	C2	22.9	153,684	115,392	-24.9%
MUN.010	C2	22.9	84,998	63,084	-25.8%
NC.007	C6	5.3	72,873	72,873	0.0%
HOS.028	C2	22.9	58,570	42,338	-27.7%
OFF.013	C1	2.0	138,148	78,146	-43.4%
NC.032	C6	5.3	64,702	64,702	0.0%
NC.027	C5	1.7	201,524	201,524	0.0%
WHS.012	C2	22.9	34,264	34,264	0.0%
MULTI-PRIV.066	C4	71.3	41,857	41,857	0.0%
MULTI-NP.140	C4	71.3	39,561	39,561	0.0%
MULTI-NP.085	C4	71.3	21,858	3,279	-85.0%
MULTI-PRIV.321	C3	1.7	313,548	285,772	-8.9%
MULTI-PRIV.322	C3	1.7	255,274	255,274	0.0%
OTHER.059	C1	2.0	4,047,647	4,047,647	0.0%
UNIV.002	C1	2.0	222,418	222,418	0.0%
NC.034	C5	1.7	141,863	141,863	0.0%
Total Adjustment without Expansion Weights (1 - Σ col (e) / Σ col (d))					-2.6%
Total Adjustment with Exp. Weights (1 - Σ (col (c)*col (e)) / Σ (col (c)*col (d)))					-5.1%

Appendix D:

TRC AND SSM WORKBOOK COMPUTATIONAL FLOW DIAGRAM