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June 30, 2011

Ms Kirsten Walli
Board Secretary
Ontario Energy Board
P.O Box 2319
2300 Yonge Street
Suite 2700
Toronto, ON M4P 1E4

Dear Ms. Walli:

Re: Natural Gas Reporting & Record Keeping Requirements
Enbridge Gas Distribution 2010 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 2010 DSM Plan Audit Report by June 30, 2011.

Enbridge has completed the 2010 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.

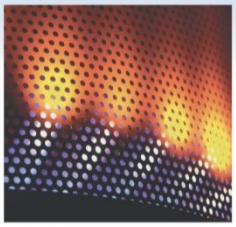
Yours truly,

Kevin Culbert
Manager, Regulatory Accounting

Attach.







Independent Audit of 2010 DSM Program Results

Prepared for Enbridge Gas Distribution

June 30, 2011

Nexant

CONTENTS

1 EXECUTIVE SUMMARY

Enbridge Gas Distribution retained Nexant, Inc. (Nexant) to complete the Independent Audit of the 2010 DSM Annual Report as required by Ontario Energy Board guidelines. The objective of the Audit is to provide an independent opinion as to the reasonableness of the Company's claims regarding DSMVA, LRAM, and SSM.

In order to accomplish this goal, the major audit activities were focused on a review of the 2010 program results which impact these financial mechanisms. Nexant reviewed the reported results from each program, completed a technical review of the Engineering Reviews conducted for the Custom programs, reviewed the 2010 Annual Report, and checked Enbridge's DSMVA, LRAM, SSM, and MT SSM calculations.

In setting 2010 audit priorities, Nexant considered several sources including: the relative net TRC benefits of programs or measures, comments from the 2010 EAC raised during the audit, comments from Enbridge staff, and recommendations from the 2009 Audit (either from the 2009 Auditor or 2009 EAC).

The adjustments as a result of this audit which impact net TRC benefits were all related to residential programs, except for one adjustment to the commercial program. In several cases the results of the third-party Verification Reports for residential programs were not applied appropriately or accurately. The overall impact on net TRC benefits is an increase in net TRC benefit of $27,317. No changes were made to the calculation methods for SSM, DSMVA, LRAM, TRC Target, or MT SSM calculations as a result of this audit. However net TRC benefit adjustments made by Nexant do impact the SSM value and adjustments to natural gas savings using best available information do impact the LRAM and TRC Target values.

Nexant also made several recommendations for improvements which do not impact 2010 results. Each recommendation is detailed within this report. The recommendations are summarized here:

- Complete an evaluation study to investigate showerhead "bag testing" accuracy to determine existing stock (baseline) showerhead flow rates.
- For prescriptive measures, include in the tracking databases and spreadsheets the definition of a participation unit (i.e. household, device or device group)
- Create a uniform, consistent calculation format for calculation of reduction factors based on Verification Reports for residential programs
- Remove unused fields in TRC/SSM spreadsheet (which is used to calculate final impacts for the Annual Report)
- Change the manner (i.e. format) that adjustment factors are incorporated in the TRC/SSM spreadsheet for ease of use
- Complete a Custom Projects Attribution Study

- Specify that contractors completing Engineering Reviews provide statement of advancement vs. replacement issue in final report
- Complete a pre-rinse spray valve verification study
- Consider making efforts to track custom project applications resulting from industrial support programs
- Require that contractors use consistent significant digits within each Verification Report for Residential programs
- Require that contractors calculate the final reduction factors in each Verification Report for Residential programs
- Determine a responsible party for calculation of precision levels for adjustment factors resulting from Commercial & Industrial Custom Engineering Reviews
- Include a focus on validating participation numbers and key project level data entered in the TRC/SSM spreadsheet in future audits. Key metrics should be validated upstream in the tracking process.
- Require that future Engineering Reviews include a more detailed review and discussion of industrial project costs. In addition, Enbridge should consider tracking additional program metrics which may provide more information to explain the benefit-cost ratios such as savings per participant and number of projects implemented as a percentage of the projects recommended by Enbridge.
- Consider allocating more program budget to custom project verification in order to increase precision levels to 90/10.
- Require that the consultants in future years completing the residential verification work analyze the effects of using the results of the verification surveys on participants outside of the sampled population on the confidence and precision levels. In addition, the consultants should make adjustments required to the sampling strategy in order to ensure that the target 90/10 confidence and precision level is achieved.
- Improve the steam trap research in future iterations of the work by providing additional details regarding the types of steam traps studied. In addition, include in the report an analysis of the statistical significance of the results.

2 INTRODUCTION AND OVERVIEW

Enbridge Gas Distribution retained Nexant, Inc. (Nexant) to complete the Independent Audit of the 2010 DSM Annual Report as required by Ontario Energy Board guidelines. The objective of the Audit is to provide an independent opinion as to the reasonableness of the Company's claims regarding DSMVA, LRAM, and SSM. This section summarizes Nexant's approach to the Audit, highlights the specific focus areas for the 2010 Audit, and provides a summary of the key findings and recommendations resulting from the Audit activities.

2.1 APPROACH TO SCOPE OF WORK

Nexant organized the audit activities into seven tasks. These tasks are summarized below, and the Final Work Plan is included in Appendix A of this document.

Task 1 Review of Custom Project Engineering Reviews

Nexant conducted a technical review of the third-party Engineering Reviews which were conducted on a sample of Enbridge's Industrial and Commercial custom projects. The goal of this task was to provide an opinion as to the quality of the review and on the reliability and reasonableness of the error ratio (and/or realization rate) when applied to a larger population of custom projects.

Task 2 Kick-Off Meeting

Nexant met with Enbridge staff and the Evaluation Audit Committee (EAC) for a kick-off meeting. The primary objective of the kick-off was to review the initial Work Plan. Nexant also obtained Enbridge and EAC input on Audit priorities. Following the kick-off, Nexant completed a "walk-through" at the Enbridge offices, meeting with key Enbridge DSM staff. Four meetings with Enbridge staff provided an introduction to the program management structure as well as the tracking and reporting process.

Task 3 Prepare Draft and Final Work Plan

The Draft Work Plan was circulated and discussed with the EAC and Enbridge in order to further define audit priorities. Although audit priorities continued to evolve throughout the process, the Final Work Plan in Appendix A captures the majority of the audit's focus areas.

Task 4 Audit 2010 Annual DSM Report & Report Deliverables

The objective of this Task was to ensure correct calculations using reasonable assumptions, based on data gathered and recorded using reasonable methods and accurate in all material respects and applicable to the 2010 DSM programs. This task included detailed review of supporting deliverables including the 2009 and 2010 Annual DSM Reports, EAC and other stakeholder comments on 2010 Annual DSM Report, and the 2009 EAC DSM Audit Summary Report.

Task 5 Verify Claimed Savings and Associated Calculations

Task 5 was completed concurrently with Task 4. In order to verify the accuracy of the 2010 Draft DSM Annual Report's calculation of TRC and associated metrics, Nexant completed an in-depth review of the following documents or data sources:

- All DSM evaluation and research conducted during 2010 (see Tasks 1 and 4 above)
- EGD's reporting on program metric results used to support the Market Transformation incentive
- Program tracking methods and results
- Participation results
- Individual measure's (both prescriptive and custom) assumptions and results (savings, measure life, free-ridership, costs)
- Methodology and assumptions used to calculate LRAM, DSMVA, MT incentive, and SSM amounts
- Program costs
- Compliance with the requirements of the Board approved methodology
- Inputs to, and results from, cost-effectiveness models used to calculate net benefits.

Task 6 Prepare Draft Audit Report

This Audit Report outlines the principles of the Audit and the Audit processes and methods. The report documents all findings and makes recommendations for additional research, evaluation, and/or program tracking activities that may be conducted in the future to reduce uncertainties identified and not resolved as a result of the audit.

Task 7 Prepare Final Audit Report

Based on the input received during distribution of the first two report drafts, present a final Audit Report.

2.2 2010 AUDIT PRIORITIES

In setting 2010 Audit Priorities, Nexant considered several sources including: the relative Net TRC Benefits of programs or measures, priorities set in preparing the Work Plan, comments from the 2010 EAC raised during the audit, and recommendations from the 2009 Audit (either from the Auditor or 2009 EAC).

Nexant focused the 2010 Audit on programs with greatest Net TRC Benefits. As outlined in Table 2-1, Nexant found that the programs with the largest impact were: Regular TAPS (in particular,

showerhead measures), all Custom projects (commercial, industrial, and multi-residential), and Prescriptive boiler projects in schools.

Table 2-1: Largest Net TRC Benefit Contributions for 2010

Program Area	Percent of Total Net TRC[1]	Significant Programs or Measures
Existing Homes	25%	The **Regular TAPS** program comprises a majority of the Existing Homes Net TRC Benefit. Of the individual measures included in the TAPS program, **showerheads** have the largest impacts.
Residential New Construction	1%	None
Low Income	<1%	None
Small Commercial	6%	None
Commercial	23%	**Commercial Custom Projects** comprise a majority of the Large Commercial Benefits. **Prescriptive Boiler Projects in Schools** were the only significant prescriptive category of measures impacting Large Commercial.
Multi-Residential	20%	**Multi-residential Custom Projects** comprise a majority of the Multi-Residential Benefits.
Large New Construction	4%	None
Industrial	25%	**Industrial Custom Projects** comprise all of the Large Industrial Savings

[1] *Percent of Total Net TRC is based on Draft Annual Report. Totals do not sum to 100% because other program costs which decrease Net TRC Benefit are not included in this table.*

Additional 2010 Audit Priorities were set with guidance from the EAC and the Company during preparing of the Work Plan. A full list of the initial Audit Priorities is included in the Final Work Plan in Appendix A. The priorities included:

- Showerhead measure life assumptions
- Use of the showerhead "bag test" to determine flow rate
- Use of quasi-prescriptive approach to showerhead measures
- Pre-rinse spray nozzle reduction factors
- Energy Recovery Ventilators/Heat Recovery Ventilators quasi-prescriptive calculations
- Application of the 2008 Custom Project net-to-gross values to current programs

- Application of CFL distribution rates from Verification Reports to ESK and TAPS Program results
- Appropriateness of Company's internal protocol for determining if measures/projects are analyzed as equipment advancement or replacement

Nexant also reviewed the 2009 Audit Report and the EAC Audit Summary Report. Enbridge provided a 'Status Update' for each 2009 recommendation in the 2010 Draft Annual Report. If Nexant agreed with Enbridge's statement that the recommendation issue was resolved, the item is not discussed in this Report. If the item remained open, Nexant included discussion of that item in this report.

Finally, additional focus areas resulted from the EAC's review of the Draft 2010 Annual Report. Some of the identified items were addressed by the Company and are not discussed herein. Items that required closer examination during the Audit are included in this report. Within this report, specific issues raised by the EAC are identified with the header *EAC Comments* in order to easily identify those issues.

2.3 KEY MEETING AND DISCUSSIONS

- Project Kick-Off Meeting with Enbridge and EAC, Meetings at Enbridge office: February 9 and 10
- Review Meeting for Draft Work Plan with Enbridge and EAC: April 7
- Weekly Audit Update Meetings with Enbridge and EAC: April 18 through June 27
- Introduction to eTools with Enbridge (Enbridge's energy analysis calculation tool): May 4
- SSM/TRC Spreadsheet Detailed Review Discussion with Enbridge Staff: May 10

Enbridge initiated an Action Log spreadsheet to track open issues related to the Audit. Nearly forty questions were addressed by the Company in response to Auditor requests through the Action Log.

2.4 KEY FINDINGS

Nexant has 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, 2010. 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.

Nexant 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 2010 DSM programs of Enbridge Gas Distribution:

TRC Savings	-	$184,593,043
SSM Amount Recoverable	-	$4,155,288
LRAM Amount Reimbursable	-	$1,346
DSMVA Amount Refunded	-	($2,717,105)

Table 2-2 details the specific changes made and their individual impacts on SSM TRC and LRAM Net Gas Savings. Table 2-3 and Table 2-4 provide a summary of the audited program results used for SSM, LRAM, and 2011 TRC Target calculations.

Table 2-2: SSM/LRAM Adjustment Detail

Program	Adjustment	Original Value	Adjusted Value	TRC Adjustment for SSM	Net m^3 Impact for SSM	TRC Adjustment for TRC Target	Net m^3 Impact for LRAM	Report Page
TAPS Partners	1.25 GPM Showerhead Replacing 2.6+ GPM Savings	88m3	82m3	$0	0	($690,202)	(330,068)	p. 20
	1.25 GPM Showerhead Replacing 2.1 GPM - 2.5 GPM Savings	46m3	50m3	$0	0	$249,770	119,445	p. 20
	CFL Reduction Factor	11.41%	14.65%	($364,082)	0	$0	0	p. 24
TAPS - Mail Insert Pilot	1.25 GPM Showerhead Replacing 2.1 GPM - 2.5 GPM Savings	46m3	50m3	$0	$0	$2,510	1,200	p. 20
	CFL Reduction Factor	1.00%	4.81%	($1,510)	0	$0	0	p. 26
Residential Equip. Replcmt.	Reflector Panel Measure Life	15	18	$0	0	$0	0	p. 27
Residential New Construction ESK	Kitchen Aerator Reduction Factor	40.09%	40.58%	($1,243)	(224)	$0	0	p. 28

Program	Adjustment	Original Value	Adjusted Value	TRC Adjustment for SSM	Net m^3 Impact for SSM	TRC Adjustment for TRC Target	Net m^3 Impact for LRAM	Report Page
	Bathroom Aerator Reduction Factor	45.84%	50.62%	($9,310)	(1,692)	$0	0	P. 28
	1.25 GPM Showerhead Reduction Factor	57.72%	49.20%	$26,528	5,033	$0	0	p. 28
	1.25 Showerhead GPM Gas Savings	46m3	48m3	$0	0	$2,729	1,305	p. 20
	1.5 GPM Showerhead Reduction Factor	54.38%	46.66%	$17,942	4,552	$0	0	p. 28
	1.5 GPM Showerhead Gas Savings	46m3	48m3	$0	0	$2,859	1,367	p. 20
	CFL (13W) 8 bulbs Reduction Factor	6.88%	8.81%	($5,882)	0	$0	0	p. 28
	Programmable Thermostats Free-Ridership Percentage	43.00%	10.00%	$42,141	20,437	$0	0	p. 28
Low Income TAPS Partners	1.25 GPM Showerhead Replacing 2.6+ GPM Showerhead Savings	88m3	82m3	$0	0	($6,458)	(3,089)	p. 20
	1.25 GPM Showerhead Replacing 2.1 GPM - 2.5 GPM Savings	46m3	50m3	$0	0	$499	239	p. 20
	Programmable Thermostats Reduction Factor	49.12%	47.00%	$3,782	997	$0	0	p. 25
Small Commercial	Condensing Boiler Participants	71	72	$0	0	$0	0	p. 35

Program	Adjustment	Original Value	Adjusted Value	TRC Adjustment for SSM	Net m^3 Impact for SSM	TRC Adjustment for TRC Target	Net m^3 Impact for LRAM	Report Page
	ERV Quasi-Prescriptive Gas Savings	200,510 m3	192,342 m3	$0	0	($26,574)	(7,760)	p. 35
	HRV Quasi-Prescriptive Gas Savings	175,228 m3	122,748 m3	$0	0	($60,886)	(17,778)	p. 35
	ERV Participants	44	41	$0	0	$0	0	p. 35
	Infrared Heater Quasi-Prescriptive Electricity Savings	245-870 kWh	16-873 kWh	$0	0	($63,436)	0	p. 35
	Programmable Thermostats	82 m3 - 538 m3 and 63 - 266 kWh	13-84 m3 and 15-48 kWh	$0	0	($1,730,463)	(510,772)	p. 35
Multi-Residential	1.25 Showerhead Replacing 3.6 GPM	91m3	69m3	$0	0	($652,056)	(311,826)	p. 20
	1.25 Showerhead Replacing 3.6 GPM	91m3	69m3	$0	0	($27,479)	(13,141)	p. 20
Commercial Custom	Electric savings were not entered in initial results	0 kWh	415,154 kWh	$318,951	0	$0	0	p. 16
Industrial & Commercial Custom	Reduce steam trap measure life per Steam Trap Study	6 years	5 years	0	0	($473,225)	0	p. 54
Total				$27,317	29,103	($3,472,413)	(1,070,877)	

Table 2-3: Adjusted TRC and Gas Savings for SSM

Program	From Enbridge Draft 2010 Annual Report			Audit Adjusted Values	
	Units	Net Gas Savings (m^3)	Net TRC Benefits	Net Gas Savings (m^3)	Net TRC Benefits
Existing Homes	788,039	8,125,183	$47,708,073	8,125,183	$47,342,481
Residential New Construction	16,080	1,553,201	$1,702,743	1,581,307	$1,772,919
Low Income	7,523	318,356	$674,016	319,353	$677,798
Total Residential	**811,642**	**9,996,740**	**$50,084,833**	**10,025,843**	**$49,793,198**
Small Commercial	7,277	4,038,642	$11,210,656	4,038,642	$11,210,656
Large Commercial	305	16,126,217	$41,251,260	16,126,217	$41,570,211
Multi Residential	32,446	14,687,999	$35,569,221	14,687,999	$35,569,221
Large New Construction	43	2,228,424	$7,348,643	2,228,424	$7,348,643
Industrial	123	18,547,131	$45,176,787	18,547,131	$45,176,787
Total Business Markets	**40,196**	**55,628,413**	**$140,556,566**	**55,628,413**	**$140,875,518**
Prog. Development	-	-	$(154,688)	-	($154,688)
Market Research	-	-	$(65,465)	-	($65,465)
Overhead	-	-	$(5,855,521)	-	($5,855,521)
Total All Programs	**851,836**	**65,625,153**	**$184,565,726**	**65,654,256**	**$184,593,043**

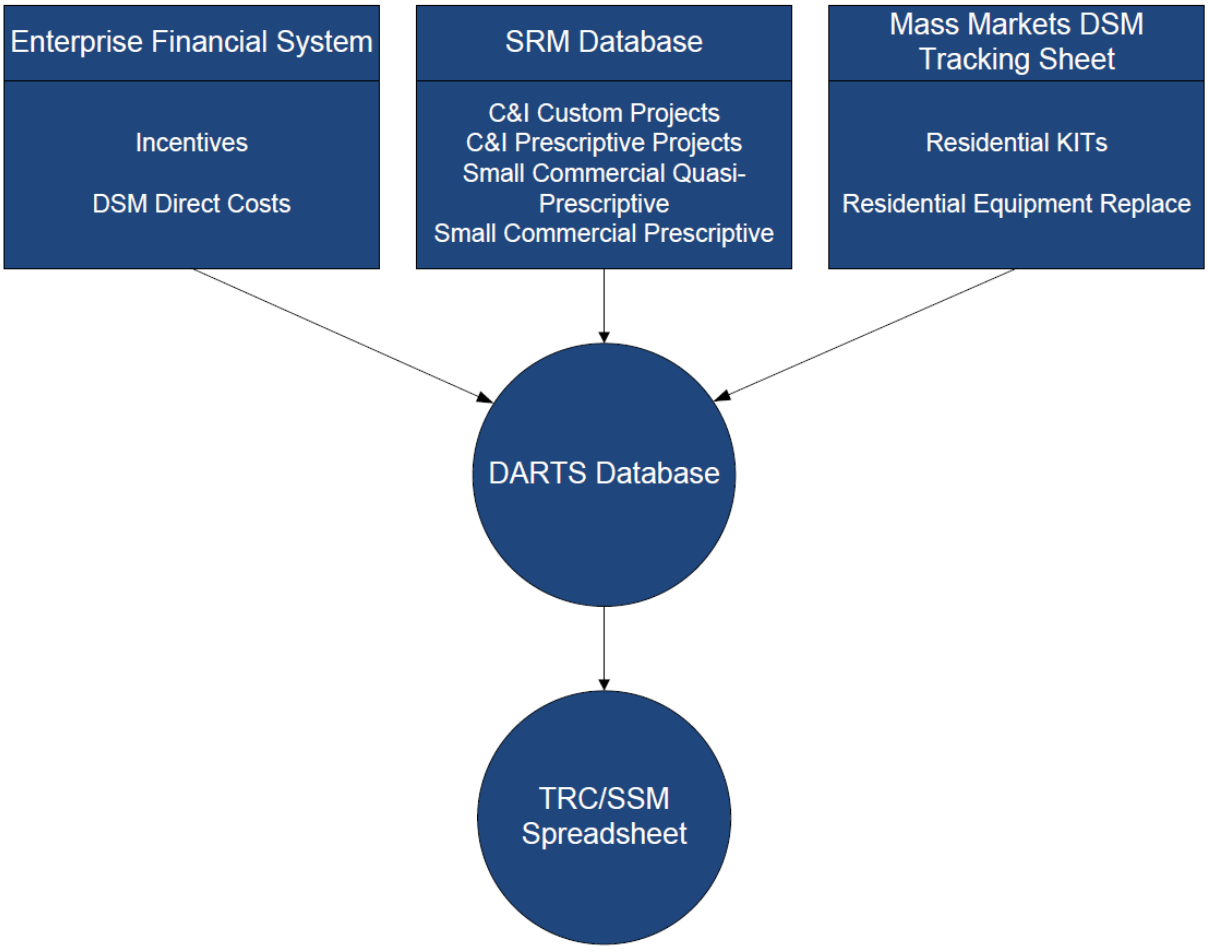
Table 2-4: Adjusted Gas and TRC Savings using Best Available Information for LRAM and 2011 TRC Target

Program	Audit Adjusted Values	
	Net Gas Savings (m^3) for LRAM	Net TRC Results for 2011 TRC Target
Existing Homes	7,915,760	$ 46,904,560
Residential New Construction	1,583,979	$ 1,778,506
Low Income	316,503	$ 671,839
Total Residential	**9,816,242**	**$ 49,354,905**
Small Commercial	3,502,333	$ 9,329,296
Large Commercial	16,126,217	$ 41,420,882
Multi Residential	14,363,032	$ 34,889,686
Large New Construction	2,228,424	$ 7,348,643
Industrial	18,547,131	$ 44,852,891
Total Business Markets	**54,767,137**	**$ 137,841,398**
Prog. Development	-	$ (154,688)
Market Research	-	$ (65,465)
Overhead	-	$ (5,855,521)
Total All Programs	**64,583,379**	**$ 181,120,630**

3 PROGRAM TRACKING AND REPORTING REVIEW

Nexant completed a review of the program tracking and reporting process. Through discussions with Enbridge staff and review of key tracking tools, Nexant found that the tracking methods in place generally result in accurate reporting. There are three databases and two tracking spreadsheets that comprise the primary data sources for the DSM Program results. Figure 3-1 depicts the tracking and reporting process as it pertains to the results presented in the Annual Report (additional steps and workflows exist but do not directly impact the Annual Report).

Figure 3-1: Enbridge Tracking and Reporting Process Summary



3.1 DATA SOURCES

The company utilizes the DARTS database to report on all DSM programs. DARTS calculates program net TRC benefits and serves as the central reporting location for DSM programs. Nexant did not access DARTS for the purpose of this Audit.

The Company's sales relationship management (SRM) database is the source of project information for the Business Markets programs which includes the Large Commercial, Multi-Residential, and Industrial Custom Projects, Multi-Residential and Large Commercial Prescriptive Projects, and Large Commercial Quasi-Prescriptive projects. The database interfaces with DARTS through an automatic upload. Nexant did not access the SRM database for the purpose of this Audit.

The "Mass Markets DSM Tracking Sheet" spreadsheet tracks all residential projects as well as the Small Commercial prescriptive projects. The information from this spreadsheet is manually input to the DARTS database. Nexant obtained a copy of this spreadsheet tool. Nexant did not complete a detailed review of the spreadsheet functionality for the purpose of this Audit.

The company's enterprise financial software is used to report all financial information. Incentives paid as well as Direct DSM Costs are tracked in this system and are automatically uploaded to DARTS. Nexant did not access this system for the purpose of this Audit.

For the purposes of the Annual Report and Audit, Enbridge creates a SSM/TRC spreadsheet and provides it to the Auditor. Relevant project information is entered in the spreadsheet from DARTS and the spreadsheet is used to recalculate net TRC benefits. Nexant completed a detailed review of this SSM/TRC spreadsheet, as detailed below.

3.2 TRC/SSM SPREADSHEET DETAILED REVIEW

The TRC/SSM spreadsheet is the central source of information for the Annual Report and SSM and DSMVA calculations. Nexant completed a line-by-line review of the portion of the spreadsheet which is used to calculate net TRC benefits. Nexant confirmed that the calculation method used for net TRC benefits is accurate and that the inputs (detailed below) appear reasonable.

For Prescriptive Measures, the TRC spreadsheet uses the following information to calculate net TRC benefits:

- Deemed savings, deemed incremental costs, deemed free-ridership values
- Reduction factors calculated in separate spreadsheets and based on results of Verification Reports
- Participation numbers from DARTS
- Incentives paid from EFS (which are only used for DSMVA calculation)

For quasi-prescriptive measures, the TRC spreadsheet uses the following information to calculate net TRC benefits:

- Measure level participation values, and calculated savings and incremental costs from DARTS
- Deemed free-ridership values
- Incentives paid from EFS (which are only used for DSMVA calculation)

For Custom Projects the TRC spreadsheet uses the following information to calculate net TRC benefits:

- Individual project level savings and incremental costs from DARTS
- Adjustment factors based on results of Engineering Reviews
- Incentives paid from EFS (which are only used for DSMVA calculation)

3.3 FINANCIAL REPORTING

Nexant reviewed the process for tracking financial results for use in the TRC/SSM spreadsheet.

Direct Program Costs

Direct Program costs are uploaded automatically from EFS to DARTS, and programmed into the TRC/SSM spreadsheet. Direct program costs are rolled up by program or by a group of similar measures. For this reason individual measure net TRC benefit calculations cannot be accurately calculated in each line of the TRC/SSM spreadsheet. Direct program costs are only accurate at a program level (i.e. Residential Existing Homes, Residential New Construction, Residential Low Income, or Small Commercial).

Incentives

For prescriptive and quasi-prescriptive measures, incentive payments are reported in EFS at a program level. The incentives are not necessarily a product of the advertised measure incentive times the number of participants. According to program staff, the reason for the discrepancy is that the financial reporting database reports actual incentives paid or accrued in 2010, while the participants included in 2010 participant counts are those that completed installation of a project in 2010.

Individual incentives for custom projects are provided in the TRC/SSM spreadsheet as reported through the company's SRM database. Total incentives for each individual sector are reported in DARTS based on the company's financial reporting database (EFS). Nexant noted that the individual incentives do not equal the total incentives reported by EFS. The reason for this is as noted above: the financial reporting database reports actual incentives paid or accrued in 2010, while the SRM system reports incentives for projects installed in 2010.

Incentive payments do not impact net TRC benefit calculations. Therefore the only reason to note the discrepancy is that incentives are included in the total program costs for the DSMVA calculation. Nexant finds that the reporting process described above is reasonable, as long as it is used consistently each year.

Nexant did not review individual project incentive payments nor check the accuracy of the EFS financial reporting system.

3.4 FINDINGS

With the goal of reporting accurate information in the SSM/TRC spreadsheet, Nexant found that the most important metrics in the tracking process are:

- *Prescriptive Participation Numbers* Participation numbers in combination with deemed values produce the savings and incremental costs required for calculation of program impacts and financial mechanisms. Since deemed values are hard coded and can easily be cross-referenced with OEB approved assumptions, tracking of deemed values through the tracking process is not critical. Participation numbers, however, are tracked in Enbridge's SRM database for Commercial and Multi-residential, and in the Mass Markets Spreadsheet for Residential & Small Commercial. After entry, they are reported to DARTS. Importantly, the definition of a participation unit varies by program. A participation unit is defined as either a household, a device (e.g. showerhead, aerator), or a group of devices (e.g. 4 CFL bulbs). This differentiation is necessary because deemed values are sometimes defined on a household basis and in other cases on a device or device group basis. The accurate tracking of participation through the tracking and reporting process is critical.
- *Quasi-Prescriptive Calculation Inputs and Individual Project Results* Quasi-prescriptive programs rely on project specific information to calculate project impacts. For example, heat recovery ventilators in the Small Commercial program, the unit's air flow capacity in CFM must be tracked to calculate the savings and incremental cost. These inputs are tracked in SRM where project savings, costs, and incentives are calculated. Therefore accurate tracking of the inputs needed to calculate the quasi-prescriptive savings and incremental cost are critical. From SRM, the project savings, costs, and incentives are uploaded into DARTS. For quasi-prescriptive programs, tracking of the quasi-prescriptive inputs initially, and later, the project-level results, is critical.
- *Individual Custom Projects Results* Individual project savings and costs must be tracked through the entire process as project impacts and costs will be unique for each entry.

Generally, Nexant found that the tracking and reporting process did result in accurate reporting for the purpose of the Annual Report and associated financial metrics. One major concern is that Enbridge identified an error for several custom projects where project level results were not tracked properly. For those projects, the electricity savings were not entered properly at some point in the tracking process, and a review of project information by Enbridge staff uncovered the error while the audit was being conducted. Several small errors made by Enbridge and found during the Audit may have been avoided by improving the process.

In addition to these tracking errors, the system is cumbersome to review or validate the data from an Auditor perspective. We recommend the following improvements.

1. For each prescriptive measure, track the definition of a participation unit (i.e. household, device or device group). The TRC/SSM spreadsheet, Mass Markets Spreadsheet, and DARTS should each have a field next to the participation number which defines participation unit.

2. Calculation of individual reduction factors should be done more systematically. During the audit, errors in calculation were found which would likely have been avoided with a consistent calculation spreadsheet. Specifically, reduction factors for the new construction

program were calculated as the sum of percentages instead of the product. Reduction factors for each program and adjustments made are discussed in further detail in Section 4. Miscalculated reduction factors accounted for about $38,000 in decrease in net TRC benefit. For consistency and clarity, Nexant recommends that a table similar to Table 3-2 below be populated using each programs' verification survey. Examples for two measures are shown below. The calculation for the reduction factor is shown in Column E.

Table 3-2: Reduction Factor Calculation

Column	A	B	C	D	E
Measure	% Materials Distributed	% Materials Installed	% Material Remaining after Removal	% Showers taken on Enbridge Showerhead or # CFLs Replacing Incandescents /# CFLs Installed *(If not applicable use 100%)*	Reduction Factor =1-(A*B*C*D)
Showerheads	100%	86%	96%	72%	40.56%
CFLs (4 bulbs)	=3.5/4	100%	98%	=2.7/2.9	20.16%

3. Unused fields in TRC spreadsheet should be removed to ensure that those which are not accurate are not mistakenly referenced. For example, individual measure TRC is calculated in the TRC spreadsheet for Custom Projects. However, as previously stated this calculation is not accurate as some DSM Direct Costs are reported only at a program level and are included in program level net TRC benefits calculation.

4. Adjustment factors for Custom projects should be more clearly indicated in the TRC/SSM spreadsheet. These factors were applied correctly in the 2010 TRC/SSM spreadsheet; however, they are not labeled and are difficult to locate in the sheet. Since these factors apply to more than two-thirds of the total 2010 Net TRC Benefit, their application should be clear in the TRC/SSM spreadsheet.

In addition, Nexant recommends that future Audit priorities include a focus on validating participation numbers and key project level data entered in the TRC/SSM spreadsheet. (During this audit, validation custom project project-level data was not an audit priority.) Key metrics (see above for a discussion of key tracking metrics) should be validated upstream in the tracking process.

3.5 AVOIDED COSTS

Nexant reviewed the values used for avoided costs for natural gas, electricity, and water to determine if they appear reasonable and if they are calculated using sources and calculation methods approved by the OEB and consistent with prior years.

Avoided costs for natural gas were updated for commodity prices. Overall avoided costs for natural gas decreased by about 7%.

Electricity costs were updated per IESO data. Overall, electricity costs increased by about 8%. The November 2009 IESO wholesale market price was used for the 2010 avoided costs, and the avoided costs for future years were adjusted using the consumer price index (CPI).

Water costs were not updated from 2009 values as certain municipalities did not have updated costs at the time avoided costs were determined. The 2009 avoided cost was applied to 2010, and the avoided costs for future years were adjusted using the consumer price index (CPI).

Nexant finds that the avoided costs appear reasonable and are calculated using OEB approved methods.

4 REVIEW OF PROGRAM RESULTS

4.1 RESIDENTIAL PROGRAMS

The audit included the review of deemed savings, free-ridership, reduction factors, program costs, and other key assumptions used by Enbridge for all Residential programs. Questions or issues raised by the EAC in regard to specific program segments or technologies were also a focus in the audit.

4.1.1 Showerhead

Low flow showerheads are an important piece of the residential programs. In 2010, they contributed over 63% of the net TRC benefits for the entire residential suite of programs. Several items relating to the low flow showerhead offerings including showerhead measure life and bag testing were addressed during the audit, and our findings are presented below.

Deemed Savings

The 2009 Audit identified adjustments to the deemed gas and water savings values for 1.25 GPM showerheads based on the *Phase II Showerhead Load Analysis Report* by SAS. Nexant verified that the reported values, shown as "Existing Natural Gas Savings" in Table 4-1 below, were used to calculate gross gas and water savings for all 1.25 GPM low-flow showerheads offered in the 2010 program year.

Substantiation Sheets for the 2011 program year were provided to Nexant by Enbridge. They included revisions to the deemed gas savings for all showerhead measures. The revised savings, calculated by Navigant and approved by the EAC, adjust the deemed savings values from the *Phase II Showerhead Load Analysis Report* using average baseline flow rates from bag tested showerheads in Enbridge's territory. The revised deemed savings values for the 2011 program year are shown in Table 4-1. These values should be used in the LRAM calculation for the 2010 program year.

In consideration of the discussion regarding Bag Tests in the TAPS Partner Program (detailed under the *Bag Testing* heading later in this Section), Nexant recommends that the deemed savings relying on average, bag-tested, baseline flow rates be revisited as results from a bag test evaluation study become available.

Table 4-1: Showerhead Deemed Values

Program	Efficient Equipment & Technologies	Base Equipment & Technologies	Existing Natural Gas Savings	2010 LRAM Natural Gas Savings
			m^3	m^3
TAPS Partners (Standard and Low Income)	Low-Flow Showerhead (Per household installed, 1.25 GPM)	2.6+ GPM showerhead	88	82
TAPS Partners (Standard and Low Income)	Low-Flow Showerhead (Per household installed, 1.25 GPM)	2.0-2.5 GPM showerhead	46	50
TAPS – Mail Insert Pilot	Low-Flow Showerhead (Per household installed, 1.25 GPM)	2.0-2.5 GPM showerhead	46	50
ESK New Construction	Low-Flow Showerhead (Per household installed, 1.25 & 1.5 GPM)	Maximum allowable by OBC (2.5GPM)	46	48

Measure Life

Nexant does not recommend any changes to the filed showerhead equipment life. The current equipment life of 10 years is consistent with industry standards.

Bag Testing

Currently, Bag Tests are conducted by a contractor on site for the TAPS Partners and TAPS Low Income programs. Contractors conduct a bag test on each showerhead to be replaced, note the existing showerhead flow rate, classify the showerhead as low flow (under 2.0 GPM), medium flow (2.0-2.5 GPM) or high flow (2.6 GPM and above) and replace any medium or high flow showerheads.

Bag testing is a common method used for testing flow rates. The test is simple and involves only a marked container (bag) and a timer. For the TAPS Partners programs, contractors use a provided bag which is marked with the test directions. Nexant made the following observations regarding the standard bag tests:

- Timing instructions for the bag tests state that each test should last "exactly 5 seconds." The short test duration could make the bag tests sensitive to human timing errors. As little as a one second difference in test duration would result in a minimum 20% error in flow reading and can easily cause misclassification of showerheads. For example:
    - A test lasting only four seconds would classify showerheads with flow rates between 2.6 and 3.3 GPM as medium instead of high flow showerheads, causing Enbridge to claim reduced savings, and showerheads with flow rates under 2.5 GPM as low flow, causing medium flow showerheads to be left in place and Enbridge to claim zero savings.

    - A test lasting six seconds would classify showerheads with flow rates between 1.7 and 2.0 GPM as medium flow, causing Enbridge to replace existing low flow showerheads and overstate savings while showerheads with flow rates between 2.2 and 2.5 GPM would be classified as high flow, causing Enbridge to overstate savings.
- Measurement instructions for the bag tests direct the user to "hold the top edge of the bag…look at the water level. The line which is closest to the water level indicates what your showerhead flow rate is..." The lines indicating flow rate on the bag are 2.0 GPM, 2.4 GPM and 3.0 GPM. Reading of the flow rate from the bag test could result in several inaccuracies:
    - The bag can be held at an angle, which could skew results
    - The limited markings do not align with the programs medium and high flow definitions, therefore any high flow classification to be an estimate.
    - Similarly, limited markings make all readings between 2.0 and 2.4 GPM and 2.4 and 3.0 GPM estimates and interpretation likely varies between contractors.

Given the potential inaccuracies discussed above, the impact of showerheads on the TAPS Partners and LI TAPS Partners program (over 6.2 million m^3 of net gas savings in 2010) and the expenses incurred from bag testing (over $520,000), Nexant recommends the Enbridge fund an evaluation study on Bag Testing and Baseline Flow Rates. Goals of the study might be:

- Evaluate the accuracy of bag testing as it is currently employed, using on-site measured data and observations;
- Comment on the use of bag test results to classify baseline flow rates for showerheads;
- Understand the baseline flow rates of showerheads in Enbridge territory;
- Consider the application of measured baseline flow rates for use in other Enbridge programs (i.e. TAPS Mail Insert Pilot);
- Consider the use of measured baseline flow rates from this evaluation study as a possible replacement for bag testing.
- Investigate cost-effective, accurate alternatives to bag testing which contractors can easily employ in the field.

4.1.2 CFL

Nexant recommends that the reduction factor take into account whether the distributed CFL bulbs replaced incandescent bulbs. For example, the results from the 2010 survey of TAPS Partners participants determined that of the average 2.9 CFLs installed, 2.8 CFLs replaced incandescent bulbs. This data had not been previously used. We adjusted the reduction factor for all CFL measures to reflect the incandescent replacement rate from the appropriate survey. The average numbers of CFLs installed and replacing incandescents are shown in Table 4-2.

Table 4-2: Average CFLs Installed and Replacing Incandescents by Program

Program	Average CFLs Installed	Average Incandescents Replaced by CFLs	Percent of CFLs Replacing Incandescent
TAPS Partners	2.9	2.8	97%
TAPS Low Income	2.9	2.9	100%
TAPS Mail Insert ESK	2.6	2.5	96%
Residential New Construction ESK	5.4	5.4	100%

Enbridge and previous EAC committees have agreed that all received CFLs would be considered installed (assuming that stored CFLs would replace existing fixtures in the near future) so the 'Average CFL Installed' values in the table above are only used as a baseline to determine the portion of CFLs replacing incandescent. Due to the way the survey was conducted, this is the proper calculation.

EAC Comments

A comment from the EAC questioned whether a heating penalty should be applied to CFL measures. A review of DSM program practices showed that most residential programs did not calculate a heating penalty for CFL lighting measures. One program that did consider a residential heating penalty, Efficiency Vermont, determined that the increased heating usage as zero[1].

While a heating penalty could be investigated and calculated for Enbridge's residential market, this does not appear to be standard industry practice, likely because the calculation is complex and would include several variables which are difficult to accurately obtain and apply for most service territories.[2] Additionally, as Enbridge is discontinuing the CFL program in 2012, Nexant does not recommend adding this investigation to the list of Enbridge's evaluation priorities. Nexant does not recommend including a heat penalty adjustment for LRAM gas savings calculations.

[1] Calculation for residential uses in Burlington, Vermont, pp. 324. *Technical Reference User Manual*, Efficiency Vermont, Feb. 19, 2010.

[2] *ACES: Default Deemed Savings Review*, State of Wisconsin Public Service Commission of Wisconsin, Focus on Energy Evaluation, Final Report June 28, 2008.

4.1.3 TAPS Partner Program

Deemed Savings

Deemed savings for the TAPS Partners program were found to be in accordance with OEB approved values. In the case of showerhead measures, adjusted deemed savings values as discussed in Section 4.1.1 apply.

Free-ridership

Free-ridership percentages for the program were found to be in accordance with OEB approved values.

Reduction Factors

Reduction factors for all water conservation measures were applied to the 2010 deemed savings based on results from the Verification Report. Nexant's review confirmed that the reduction factors for kitchen and bathroom aerators were correctly calculated from the not-installed and removal rates published in the quarterly surveys and that showerhead reduction factors took into account the verified percentage of showers taken on Enbridge showerheads in additional to the installation and removal rates.

As discussed in Section 4.1.2, Nexant recommends that the reduction factor applied to the CFL measure be adjusted to account for incandescent replacements only. The reduction factor for CFLs was increased from 11.41% to 14.65%. This adjustment resulted in a decrease of $364,082 in the net TRC benefits for the TAPS Partners Program.

Application of Verification Results

One Verification Report that related to the TAPS Partner Program was completed in 2010. The *Regular TAPS Partner Program 2010 Year-End Research Report* surveyed 3,200 residential customers who received a home visit from a TAPS' contractor during 2010. The annual report results were based on surveys completed each quarter for the program. Results from the quarterly surveys were used to determine the appropriate reduction factor for each measure. This Verification Report and survey methods are reviewed in Section 5. Reduction factors and their applications are reviewed in the preceding Reduction Factors section.

EAC Comments

The EAC raised a concern that low flow showerheads replacing those with a high flow may have a larger removal rate than those replacing medium flow and that the current verification surveys do not take baseline flow rates into account when determining removal rate. Currently, verification surveys are conducted on a random sample of customer projects. However, since TAPS contractors report only one flow rate per household, identifying the baseline showerhead flow rate for each showerhead installed is not trivial. While it would be possible to calculate independent reduction

factors based on baseline showerhead flow rate, this change would require changes to contractor data collection techniques. Furthermore, additional analysis would need to be added to the verification reports to correlate baseline flow rate results with removal rates.

Tracking of independent removal rates will likely have a small effect on total TRC.

Since we have considerable reason to believe that the bag tests may be inaccurate we do not recommend using those results to calculate unique reduction factors. Nexant recommends that the accuracy of the baseline flow rates, as discussed Section 4.1.1 should be addressed first. Nexant does not recommend this topic as an evaluation priority for 2011.

4.1.4 Residential Low Income

Deemed Savings

Deemed savings for the Low Income TAPS Partners program were found to be in accordance with OEB approved values. In the case of showerhead measures, adjusted deemed savings values as discussed in Section 4.1.1 apply.

Free-ridership

Free-ridership values for the program were found to be in accordance with OEB approved values.

Reduction Factors

Reduction factors for all measures were applied to the 2010 deemed savings based on results from the Verification Report. Nexant's review confirmed that the reduction factors for kitchen and bathroom aerators were correctly calculated from the not-installed and removal rates published in the Verification Report and that showerhead reduction factors took into account the verified percentage of showers taken on Enbridge showerheads in additional to the installation and removal rates.

Reduction factors for the programmable thermostat measure were incorrectly calculated using a removal rate of 4%. Nexant recalculated the reduction factor for the measure using the 0% removal rate published in the Verification Report. The reduction factor for programmable thermostats was decreased from 49.12% to 47.00%. This adjustment resulted in an increase of $3,781.93 in the net TRC benefits for the TAPS Low Income Program.

As discussed in Section 4.1.2, Nexant recommends that the reduction factor applied to the CFL measures be adjusted to take incandescent replacement into account. The reduction factor for CFLs did not change due to this adjustment.

Application of Verification Results

One Verification Report that related to the Low Income TAPS program was completed in 2010. The *Low Income TAPS Partner Program 2010 Year-End Research Report* surveyed 57 low income residential customers who received a home visit from a TAPS contractor during 2010. Results from the survey were used to determine the appropriate reduction factor for each measure. This Verification Report and survey methods are reviewed in Section 5.

4.1.5 TAPS Partners Program – Mail Insert Pilot

Deemed Savings

Deemed savings for the TAPS – Mail Insert Pilot program were found to be in accordance with OEB approved values. In the case of showerhead measures, adjusted deemed savings values as discussed in Section 4.1.1 apply.

Free-ridership

Free-ridership values for the program were found to be in accordance with OEB approved values.

Reduction Factors

Reduction factors for all measures were applied to the 2010 deemed savings based on results from the Verification Report. Nexant's review confirmed that the reduction factors for kitchen and bathroom aerators were correctly calculated from the not-installed and removal rates published in the Verification Report and that showerhead reduction factors took into account the verified percentage of showers taken on Enbridge showerheads in additional to the installation and removal rates.

As discussed in Section 4.1.2, Nexant recommends that the reduction factor applied to the CFL measures be adjusted to take incandescent replacement into account. The reduction factor for CFLs is increased from 1% to 4.81%. This adjustment results in a decrease of $1,510 in the Net TRC Benefits for the TAPS – Mail Insert Pilot program.

Application of Verification Results

One Verification Report that relates to the TAPS – Mail Insert Pilot program was completed in 2010. The *TAPS Energy Conservation Offer – Mail Inset Test Verification Research Report* surveyed 150 Enbridge customers who requested and received a kit of energy efficiency products through the mail at no charge. Results from the survey were used to determine the appropriate reduction factor for each measure. This verification report and survey methods are reviewed in Section 5. Reduction factors and their applications are reviewed in the preceding Reduction Factors section.

EAC Comments

The EAC raised a question regarding the baseline flow rate for the mail-insert showerhead measure. Currently, all baseline flow rates are assumed to be between 2.0 and 2.5 GPM, classifying all

replaced showerheads as medium flow. The EAC questioned whether a study to verify average baseline would be warranted. Given the small size of the program, less than 0.04% of net TRC benefits, Nexant did not focus on this question for the audit. Nexant did analyze the effect of applying the baseline flow rate distribution from the TAPS Partners program to the Mail Insert Pilot as shown in Table 4-3 and found that the current claimed gas savings are likely more conservative.

Table 4-3: Analysis of Mail Insert Pilot Gas Savings using Bag Test Baseline Flow Rate Results

TAPS Mail Insert Pilot	Deemed Gas Savings (m^3)	Current Participant Distribution	Gross Gas Savings (m^3)	Participant Distribution based on Bag Test Results		Gross Gas Savings (m^3)
Low Flow (under 2.0 GPM)	0	0	-	12%	65	0
Medium Flow (2.0-2.5 GPM)	46	541	24,886	31%	168	7,715
High Flow (2.6+ GPM)	88	0	-	57%	308	27,137
Totals		541	**24,886**	100%	541	**34,851**

Nexant is comfortable with the assumptions used by Enbridge for the showerhead baseline flow rate for the Mail insert Pilot. In Section 4.1.1, Nexant recommended a baseline flow rate study as part of an evaluation of bag testing. The results of such a study should be evaluated for application to the Mail Insert Program and would eliminate the need for a dedicated mail insert baseline evaluation.

4.1.6 Residential Equipment Replacement

Because the Equipment Replacement program was not offered in 2010, Nexant did not focus on the review of these programs. Program deemed savings, free ridership and measure life and incremental costs were checked against the 2010 filed assumptions. The few incentives honored in 2010 were found to be in accordance with filed assumptions. No adjustments to net TRC benefits were made for this program.

One typo was found in the SSM spreadsheet. The measure life for reflector panels was incorrectly entered as 15 years instead of 18. This typo was corrected but had no effect as there were zero program participants in 2010

4.1.7 Low Income Weatherization

The Low Income Weatherization gas savings is incorrectly stated in the filed assumptions. Enbridge noted that the savings are incorrectly listed as 1,134 m^3 when the actual approved value should be 1,143 m^3. Nexant recommends that Enbridge correct this error in the filed assumptions table moving forward to eliminate confusion. No adjustment to the net TRC benefits was required for this measure because the correct value was used in the calculations.

4.1.8 Residential New Construction Energy-Savings Kit

Deemed Savings

Deemed savings for the Residential New Construction Energy-Savings Kit (ESK) program were found to be in accordance with OEB approved values. In the case of the 1.25 GPM low flow showerhead measure, adjusted deemed savings values as discussed in Section 4.1.1 apply.

Nexant found that the 1.5 GPM hand-held showerhead gas savings were not adjusted based on the results of the SAS load study. Nexant recommends that savings value be reduced in-line with all other residential showerhead savings as discussed in Section 4.1.1. The 1.5 GPM hand-held showerhead gas savings would be decreased from 46m^3 to 32m^3. This adjustment results in a decrease of 9,559 m^3 in net gas savings for the measure. This change will be accounted for in the LRAM calculation for 2010.

Free-ridership

The free-ridership percentage for the programmable thermostat measure was incorrectly entered as 43%. The approved value per the May 2010 filed assumptions for the 2009 program is 10%. This adjustment resulted in an increase of $42,140.91 in the Net TRC Benefits for the Residential New Construction ESK program. Other free-ridership percentages for the program were found to be in accordance with OEB approved values.

Reduction Factors

The program delivery model for the Residential New Construction program changed in August 2010 from builder installed measures to an energy-savings kit for customer installation. Given this change in delivery, the program reduction factors for May to July 2010 differ from those for the August to December timeframe. For May to July 2010 a 0% reduction factor was applied, given that all measures were installed by the builder. For the customer installed model offered August to December, Nexant found that the reduction factors were calculated incorrectly. It was found that reduction factors for the program had been calculated as the sum of the not-installed rate, removal rate and percent of showers on non-Enbridge showerheads instead of the product of the installation rate, the percent remaining after removal and the percent of shower on Enbridge showerheads. Because of the way the Verification survey was done, this is the correct calculation. Nexant recalculated the reduction factors and applied the corrected factors to the 2010 deemed savings.

In addition, Nexant adjusted the reduction factor for CFLs to take incandescent replacement into account as discussed in Section 4.1.2.

Nexant also adjusted the reduction factor for bathroom aerators to include the distribution rate and the ratio of number of aerators received to those installed reported in the Verification Report.

The corrected reduction factor values and their impacts for the Residential New Construction ESK Program are listed in Table 4-4. Note that the programmable thermostat reduction factor did not change since the only contributing factor was the material installation rate.

Table 4-4: Revised Reduction Factor and TRC Impacts for Residential New Construction ESK Program

Measure	Revised Reduction Factor	TRC Impact for SSM
Kitchen Aerators	40.58%	($1,243)
Bathroom Aerators	50.62%	($9,310)
1.25 GPM Showerheads	49.20%	$26,528
1.5 GPM Hand-held Showerhead	46.66%	$17,942
CFL (13W) 8 bulb	8.81%	($5,882)

Application of Verification Results

One Verification Report that related to the Residential New Construction program was completed in 2010. The *Builders' Energy-Savings Kit Verification Research Report* surveyed 150 new homeowners who received Enbridge's energy-savings kit, courtesy of their builders. Results from the survey were used to determine the appropriate reduction factor for each measure. This verification report and survey methods are reviewed in Section 5. Reduction factors and their applications are reviewed in the preceding Reduction Factors section.

4.2 BUSINESS MARKETS

4.2.1 Free-Ridership for Custom Projects

Custom measures use free-ridership values by sector as reported in the *Custom Projects Attribution Study Final* report (Summit Blue, October 31, 2008). Table 4-5 provides a summary of the results.

Table 4-5: Free Ridership Deemed Values for Enbridge Custom Projects

Sector	Free-Ridership
Agriculture	40%
Commercial Retro-fit	12%
Industrial	50%
Multifamily	20%
New Construction	26%
Total	41%

Enbridge and the EAC agreed with a recommendation made by the 2008 Auditor to update the attribution study. However, this work has been delayed since the new DSM Guidelines may change how free-ridership is handled. Enbridge and the EAC have agreed that they would wait for the 2012 DSM Guidelines to be finalized before initiating an Attribution Study.

Due to the unforeseen delay of the updated DSM Guidelines, free-ridership rates determined from projects completed largely in 2007 (the Study included custom projects completed between Q4 2006 and Q3 2007) are now being applied three years later to 2010 projects, and will also be applied to 2011 projects. Nexant agrees with the decision to apply these results for more than one year, but due to the ongoing delay in obtaining updated results, we believe that a discussion of the application of results three to four years out of date is warranted.

Summit Blue noted in the Final Report that the following key factors drive the particular results of the Study:

- Several large projects in the study population had high free-ridership rates. Summit Blue stated that if those large projects were eliminated from the population, the overall combined (Union & Enbridge) free-ridership would drop from 48% to 34% (Summit Blue, Page v, page 30).
- Machine/process measures accounted for 44% of the gross savings and had a combined (Union & Enbridge) free-ridership rate of 56% (Summit Blue, Page 31).
- HVAC measures accounted for 39% of the gross savings and had a combined (Union & Enbridge) free-ridership rate of 46% (Summit Blue, Page 31).

In addition, it is notable that the impacts of the projects on which the Study was based were distributed across Sectors much differently than the 2010 impacts (Table 4-6). Because the sample sizes for individual sectors were often small, Summit Blue recommended that the overall free-ridership rate should have been used instead of the sector-specific rates (Summit Blue, page ii). Despite this recommendation, the sector-specific results would be applied instead. Nexant does not challenge this decision as it has been presumably reviewed in previous audits; however, we believe it is important to note these changes in program participation as they are one indicator of changes in custom programs since 2007.

Table 4-6: Custom Projects Gross Savings by Sector, 2007 and 2010

Sector	Gross m^3 Savings as Percent of Total, Q4 2006-Q3 2007	Gross m^3 Savings as Percent of Total, Q1 2010 to Q4 2010
Agriculture	3%	4%
Industrial	77%	35%
Multifamily	8%	27%
New Construction	2%	5%
Commercial Retrofit	10%	30%

The most significant concern regarding the use of the Attribution Study results is specific to the Industrial Sector. The 2010 Draft Annual Report states that the industrial sector was significantly affected by the economic recovery (or lack thereof) in 2010. In 2009 and 2010 incentives were increased. These facts, combined with Summit Blue's observation that several large projects did drive the findings of the 2008 study, lead us to believe that utilizing the 2008 free-ridership study as substantiation for the 2010 free-rider assumptions is likely resulting in conservative calculations of net TRC benefits (i.e. we would suspect that free-ridership rates would be less than documented in the 2008 study).

It is not with the scope of this study to complete the work to update the free-ridership values.

Because the free-ridership rates are likely conservative and better information is not available, we do accept the use of these free-ridership rates in 2010. We strongly believe that updating the Attribution Study for Commercial and Industrial Custom projects must be a priority going forward. Continued application of the free-ridership results that are invalid for the current program year to such a large portion of Enbridge's program impacts is not appropriate and needs to be corrected going forward.

EAC Comments

The 2010 EAC raised a concern about low incentive levels in some program areas and the possible relationship to free-ridership. It is standard practice in energy efficiency program design is to ensure a program offers an incentive that is a large enough percentage of the incremental cost to be a significant and primary influence in the customer's decision to implement energy efficiency. The logic is that offering a small percentage of the incremental cost may result in a program with high free-ridership rates. For this reason, the EAC raised concerns with the low incentive levels overall, most notably New Construction.

Nexant reviewed incentive levels compared to free-ridership rates. Incentive levels were reviewed at a program level based on the ratio of the incentive to the incremental cost. Table 4-7 provides a

summary of this review. Nexant does share the same concern raised by the EAC; low incentive levels may result in high free-ridership rates.

Table 4-7: Free-ridership Rates and Incentive/Incremental Cost Ratios, 2010

Sector	Deemed Free-Ridership	Incentive / Incremental Cost
Agriculture	40%	12%
Commercial Retro-fit	12%	16%
Industrial	50%	33%
Multifamily	20%	22%
New Construction	26%	4%
Total	41%	19%

Wisconsin's Focus on Energy program (Focus) has studied this topic over the last several years with interesting results. An evaluation of July 2004 through December 2004 projects[1] studied the impact of incentive level to attribution. The author found that the expected relationship was true for commercial & industrial sectors: higher incentive appeared to be related to lower free-ridership values. But in agriculture programs, there was no relationship. The recommendation resulting was that "the financial assistance provided by the program should be sufficiently high to encourage rebated measures to be installed by those other than early adopters".

In the evaluation of the July 2007 to September 2008 programs[2], the author revisited the issue. Based on the previous recommendations, Focus had raised incentive levels in some program areas hoping to increase attribution. The evaluation found that attribution levels did not increase. The author notes that the economic decline during the examination period may have had an effect. They stated that economic decline could be argued either to increase or decrease attribution. (Enbridge commented that their industrial sector was affected by economic decline in 2010.) This report provides a well-supported study of the effect of changing incentive levels and concluded that the correlation is not strong enough to use incentive levels alone to predict or control free-ridership.

[1] *Business Programs: A Behind-the-Scenes Look at Attribution,* State of Wisconsin, Public Service Commission of Wisconsin, Focus on Energy Statewide Evaluation, June 21, 2006, PA Consulting Group, Inc.

[2] *Business Programs: Additional Looks at Attribution*, State of Wisconsin, Public Service Commission of Wisconsin, Focus on Energy Statewide Evaluation, February 26, 2010, PA Consulting Group, Inc.

Therefore, based on the outdated free-ridership values available (as discussed above), and in the absence of a complete study of factors affecting Enbridge custom project attribution, we cannot provide an opinion on the relationship between incentive levels and attribution for Enbridge's 2010 programs.

4.2.2 Equipment Replacement Projects Advancement and Replacement

Both the 2008 and 2009 Audits included discussion of the decision rules for categorizing Custom projects as advancement or replacement. The rules suggested by the 2008 Auditor have been adopted by Enbridge.

For replacement type measures, Nexant discussed the program approach with Enbridge staff in order to determine if energy savings were being calculated on an incremental basis. For custom projects calculated in eTools, Enbridge staff indicated that the eTools calculator does determine incremental energy savings for replacement type measures. Enbridge staff also state that savings calculated for custom projects analyzed using third-party analysis tools are also calculated on an incremental basis. Additionally, Enbridge reported that incremental savings were also included in the third-party Engineering Review. Nexant's audit of the Engineering Review did not uncover any issues with the treatment of replacement type measures, however Nexant did not conduct an additional focused review to identify and assess replacement type projects. In the case of New Construction projects, Nexant did verify during the audit of the Engineering Review that energy savings were calculated on an incremental basis.

Nexant conducted similar discussions with Enbridge regarding the cost calculation for replacement measures. Enbridge reported that costs are calculated on an incremental basis for replacement type measures, comparing the cost of the high-efficiency equipment to the cost of standard efficiency or code-required equipment and that the Engineering Review checks that this is done properly. Again, Nexant did not specifically audit projects to validate that this was reviewed appropriately but did not find any issues within the audited projects.

For advancement type measures, Nexant reviewed the list of Custom projects to determine if measure life was appropriately adjusted. (Full energy savings for advancement measures should not be claimed over the full life of the new equipment.) Nexant found that for boiler measures coded as "advancements" a discounted measure life was used. According to Enbridge staff, this discounted measure life was agreed upon with the 2007 EAC. Nexant was satisfied with Enbridge's explanation of the treatment of advancement measures.

Enbridge stated that the Engineering Review included study of the treatment of advancement versus replacement. To report on this work, we recommend the Engineering Reviews include a statement on the following issues for replacement and advancement type measures:

- Were the decision rules set by Enbridge applied correctly to categorize measures as advancement or replacement?

- For replacement measures, were energy savings and project costs calculated on an incremental basis?

4.2.3 Large Commercial Custom and Prescriptive

The Large Commercial program accounts for 26% of the total net TRC benefit for 2010. Custom measures comprise a large majority of the Large Commercial program (about 90%) and while prescriptive measures are also offered, the only significant prescriptive measure for 2010 was the high efficiency boilers measure for schools.

Custom Savings Estimates

Savings for commercial custom projects are determined using either calculations from third-party engineering firms or, where applicable, Enbridge's eTools calculator. Savings for custom measures are addressed by the Engineering Review discussed in Section 5. Measure life assumptions used for custom projects used OEB approved values where available, or otherwise used reasonable assumptions. We do not recommend any changes to the 2010 results.

Deemed Values

In 2010, about 100 prescriptive projects were completed, where the large majority of those were high efficiency boilers in schools. Nexant found that savings, measure life, and incremental costs for prescriptive measures were based on deemed values approved by the OEB.

Free-ridership

Prescriptive measures follow OEB approved free-ridership values.

Custom projects use deemed free-ridership values from the 2008 Attribution Study discussed in Section 4.2.1. Nexant found that these values were correctly applied in the calculation of net savings.

Application of Engineering Review

The results of the Engineering Review were applied appropriately to the natural gas, electricity, and water savings for all commercial custom projects. (See Section 5 for discussion of the Engineering Review). The adjustment factors were applied to the entire population of commercial custom project energy savings.

Incentives

The discussion in Section 3.3 regarding incentive reporting also applies here. For the Large Commercial Programs, the SRM reported total incentive is $1,755,335 while the EFS reported incentives used for the DSMVA calculation were $1,961,877. We do not recommend any changes to the 2010 results.

4.2.4 Small Commercial Prescriptive and Quasi-Prescriptive

The Small Commercial program was relatively small in 2010, although not insignificant (about 5% of net TRC benefits). The program includes both prescriptive and quasi-prescriptive measures including water conservation, HVAC measures, and water heating applications.

Deemed Values

Deemed values for prescriptive measures were accurately based on deemed savings, incremental cost, and free-ridership values from OEB approved assumptions.

Savings and incremental cost for several quasi-prescriptive measures were not reviewed in detail during this audit. Those values appear to be based on the OEB approved quasi-prescriptive deemed values, and Nexant did not review project files to check that the project-specific information such as ERV or HRV air delivery capacity (CFM) or boiler or unit heater heating capacity (BTU/hr) was properly used in the quasi-prescriptive calculation. See Section 3 for discussion of the tracking and reporting review performed during this audit.

Enbridge notified Nexant that a change to the deemed values for infrared heating measures was accepted by the OEB in May of 2010. The natural gas savings do not change. The change in quasi-prescriptive electricity savings applies to the 2011 TRC Target calculation. Nexant reviewed the calculations completed by Enbridge to adjust the infrared electricity savings and finds that the adjusted values are correct. The results are included in Table 2-2.

A change in deemed values for programmable thermostats has been agreed up on with the EAC and is being filed for use in 2011 assumptions. This is considered best available information for LRAM and TRC Target calculations. Nexant reviewed the calculations completed by Enbridge to adjust the multi-residential programmable thermostat quasi-prescriptive savings for both gas and electricity. The calculations are correct, and the adjustments which apply to LRAM and TRC Target calculations are included in Table 2-1.

Application of Verification Results

No verification work was completed for small commercial measures.

Reduction Factors

Enbridge currently uses a 2% reduction factor for pre-rinse spray valves to account for removal of the valves after contractor installation. Unlike other reduction factors used, this value is not based on any survey work. The value was agreed upon with the Enbridge and the 2009 EAC after exploring options to obtain a more accurate value by either completing Verification work or obtaining a value from another utility program. At the time, Verification work was not possible because it would be difficult to locate the appropriate staff person to confirm installation and because site visits would need to occur during off-peak restaurant hours. Enbridge attempted to obtain a reduction value

from another utility program. The only value available (from a Manitoba Hydro program) was 0.6%. This discussion is summarized in a Memorandum dated January 2010.

Enbridge has taken the following actions, as agreed upon with the 2009 EAC, to establish contact information with participants so that in the future, verification work would be feasible:

- Enbridge has begun confirming the installation of the pre-rinse spray valve only with the restaurant manager and
- Enbridge has begun collecting contact information for that person and
- Old pre-rinse spray valves are discarded upon installation of the new product, making it more difficult for the customer to revert to the old technology

About 2,000 pre-rinse spray valves projects were completed in 2010. Pre-rinse spray valves account for less than 2% of total volume of natural gas savings, 8% of total volume of water savings, and 1% of total net TRC benefit. Nexant recommends that Enbridge implement a Verification Study for 2011 if such a study is feasible.

Incentives

Incentive payments reported are based on the Company's financial tracking system.

EAC Comments

The EAC raised the issue of the application of recent ERV/HRV research (*Evaluation of Natural Gas DSM Measures: Energy Recovery Ventilators & Heat Recovery Ventilators*, Nexant, 2010) to the custom ERV/HRV measures. Since Nexant authored the report, it was agreed that review of the content of the ERV/HRV study would not be included in the scope for the 2010 Audit. The ERV/HRV study has been accepted as best available information for 2010 LRAM assumptions and 2011 Assumptions.

As mentioned in the preceding Deemed Values section, Nexant does not have access to the quasi-prescriptive calculators used to determine ERV/HRV savings. However, Nexant was able to modify the savings for each of the quasi-prescriptive ERV or HRV measures using the 2010 Mass Markets DSM Tracking spreadsheet to reflect the updated assumptions accepted by Union Gas and their EAC during the 2009 Audit. The current values used by Enbridge and the best available values from Union Gas' updated substantiation sheets are shown in Table 4-8 and Table 4-9. Applying the updated gas savings to the ERV and HRV projects for 2010 resulted in a net gas savings decrease of 7,756 m^3 for ERV projects and 49,856m^3 for HRV projects. This change will be accounted for in the LRAM calculation for 2010. The quasi-prescriptive formulas for savings and cost should be fully revised in-line with the corresponding Union Gas substantiation sheets (#s 36, 37, 40 & 41) for the 2011 program year.

Table 4-8: Current and Best Available Gas Savings values for Existing and New Commercial ERV Measures

Market Segment	Existing Commercial ERV		New Commercial ERV	
	Current Gas Savings per CFM Value (m^3/CFM)	Best Available Gas Savings per CFM Value (m^3/CFM)	Current Gas Savings per CFM Value (m^3/CFM)	Best Available Gas Savings per CFM Value (m^3/CFM)
Hotel	5.14	3.40	4.89	3.21
Restaurant	3.30	3.40	3.14	3.21
Retail	3.30	3.40	3.14	3.21
Office	1.84	2.17	1.75	2.05
School	2.57	2.17	2.44	2.05
Health Care	5.14	6.12	4.89	5.77
Nursing Home	5.14	6.12	4.89	5.77
Warehouse	5.14	2.17	4.89	2.05

Table 4-9: Current and Best Available Gas Savings values for Existing and New Commercial HRV Measures

Market Segment	Existing Commercial HRV		New Commercial HRV	
	Current Gas Savings per CFM Value (m^3/CFM)	Best Available Gas Savings per CFM Value (m^3/CFM)	Current Gas Savings per CFM Value (m^3/CFM)	Best Available Gas Savings per CFM Value (m^3/CFM)
Hotel	4.90	2.61	4.55	2.38
Restaurant	3.15	2.61	2.92	2.38
Retail	3.15	2.61	2.92	2.38
Office	1.75	1.67	1.62	1.52
School	2.45	1.67	2.27	1.52
Health Care	4.90	4.70	4.55	4.28
Nursing Home	4.90	4.70	4.55	4.28
Warehouse	4.90	1.67	4.55	1.52

4.2.5 Multi-Residential Custom and Prescriptive

The multi-residential program included both custom and prescriptive incentive offerings. A majority of the savings and net TRC benefits for 2010 were from custom projects at multi-residential private facilities. The prescriptive measures with the largest impact were showerheads and aerators.

Custom Saving Estimates

Custom savings estimates were analyzed in the same way as Large Commercial Custom projects, and Multi-residential impacts were included in the Engineering Review. See Section 5 for discussion of Nexant's audit of the Engineering Review. We do not recommend any changes to the 2010 results.

Deemed Values

Multi-residential prescriptive measures followed OEB approved assumptions for deemed savings, incremental cost, and free-ridership.

Per the discussion in Section 4.1.1 regarding the revision of deemed gas savings values for showerheads, revised gas savings for the 2011 program year for Multi Residential Showerhead measures should be taken into account in the calculation of the 2010 LRAM. The revised deemed gas savings values are shown in Table 4-10 below.

Table 4-10 Showerhead Deemed Savings Values, Multi-Residential

Program	Efficient Equipment & Technologies	Base Equipment & Technologies	Existing Natural Gas Savings	2010 LRAM Natural Gas Savings
			m^3	m^3
Multi Family (Existing Buildings)	Low-Flow Showerhead (Per household installed, 1.5 GPM)	3.6 GPM	91	69

Free-ridership

Prescriptive measures used OEB approved free-ridership values.

Custom measures use deemed free-ridership values from the 2008 Attribution Study. The discussion of the application of this work to the 2010 program in Section 4.2.1 also applies to the Multi-residential custom projects. We do not recommend any changes to the 2010 results.

Application of Verification Results

One Verification Report that related to the Multi-residential prescriptive program was completed in 2010. The *Showerhead Verification among Rental Buildings Research Report* randomly selected 662 units across 29 of 65 buildings for verification. Results from the audit were used to determine the number of showerheads in participating rental buildings that were installed and not removed. This work is reviewed in Section 5. Nexant found that those results were properly applied to the deemed savings for multi-residential showerheads.

Reduction factors for all other prescriptive multi-residential measures were applied to 2010 deemed savings based on work completed in previous years. Nexant's review confirmed that those reduction factors were consistent with the 2009 approved values, but Nexant did not re-review those results.

Incentives

The discussion in Section 3.3 regarding incentive reporting also applies here. The total custom incentive as reported in EFS is $2,411,648 while the total incentive as reported in SRM is $2,275,836.

For the multi-residential program as a whole, the difference between the EFS and SRM values was reasonable. We do not recommend any changes to the 2010 results.

4.2.6 Large New Construction Custom

Savings Estimates

Custom savings estimates were analyzed in the same way as Large Commercial Custom projects, and new construction impacts were included in the Engineering Review. See Section 5 for discussion of Nexant's audit of the Engineering Review. We do not recommend any changes to the 2010 results.

Free-ridership

Deemed free-ridership values from the 2008 Attribution Study are used for New Construction projects. The discussion of the application of this work to the 2010 program in Section 4.2.1 also applies to the New Construction projects. We do not recommend any changes to the 2010 results.

Application of Engineering Review

The results of the Engineering Review were applied appropriately to the natural gas, electricity, and water savings for all commercial custom projects. (See Section 5 for discussion of the Engineering Review). The Adjustment Factors were applied to the entire population of commercial custom projects energy savings.

Incentives

The discussion in Section 3.3 regarding incentive reporting also applies here. The total custom incentive as reported in EFS is $178,706 while the total incentive as reported in SRM is $298,687. For the New Construction program as a whole, the difference between the EFS and SRM values was more significant than for Multi-residential or Large Commercial. However, due to the small participation numbers (43 projects) the differences are not unreasonable – carryover of several large projects from a population of 43 projects could change the incentive significantly. We do not recommend any changes to the 2010 results.

EAC Comments

The 2010 EAC raised a question regarding the relatively low incentives for Commercial New Construction. As discussed in Section 4.2.1, the incentive levels alone do not prove either high or low attribution. However, the 4% incentive level for new construction is certainly low. Whether or not it indicates attribution levels, it raises questions about the accuracy of the cost information used as well as the possibility that participation is not growing as quickly as it could if incentives were higher. Nexant recommends that Enbridge consider raising incentive levels after a review of the current program, including: incentive levels for similar programs, customer satisfaction with current program, and the affect of the construction industry on the program, at a minimum. This work is not

recommended as an evaluation priority for 2011 due to the small size of the New Construction program.

4.2.7 Industrial Custom

The program accounted for 25% of net TRC benefits. The Industrial program is comprised entirely of custom projects. Projects are categorized as Industrial or Agriculture, with the Agriculture projects accounting for about 5% of the net TRC benefits for the Industrial Custom projects. The most significant measures contributing to natural gas savings were furnaces for process heating, industrial process equipment, and heat recovery for process heating or space heating. These top three measures accounted for 33 of 123 participants and more than half of the natural gas savings. Other significant measures included steam traps, ventilation controls, and greenhouse curtains.

Enbridge noted in the Draft Annual Report that the economic conditions in 2010 affected participation.

Savings Estimates

Savings for industrial custom projects are determined using either calculations from third-party engineering firms or, where applicable, Enbridge's eTools calculator. Savings for custom measures are addressed by the Engineering Review discussed in Section 5. Measure life assumptions used for custom projects were all per OEB approved values. We do not recommend any changes to the 2010 results.

Free-ridership

A deemed free-ridership value from the 2008 Attribution Study is used for Industrial projects. The discussion of the application of this work to the 2010 program in Section 4.2.1 also applies to the Industrial projects. We do not recommend any changes to the 2010 results.

Application of Engineering Review

The results of the Engineering Review were applied appropriately to the natural gas, electricity, and water savings for all industrial custom projects. (See Section 5 for discussion of the Engineering Review). The adjustment factors were applied to the entire population of industrial custom projects energy savings.

Incentives

The discussion in Section 3.3 regarding incentive reporting also applies here. The total custom incentive as reported in EFS is $2,097,700 while the total incentives as reported in SRM are $2,148,889. For the industrial program as a whole, the difference between the EFS and SRM values was not significant. We do not recommend any changes to the 2010 results.

EAC Comments

The EAC raised a concern regarding the high benefit-cost ratios for the custom programs, with Industrial being of most concern. Table 4-11 summarizes the 2010 benefit-cost ratios (values are based on the Draft Annual Report). The benefit-cost ratio was calculated as:

$$Benefit{:}\,cost\ ratio = \frac{NPV\ Benefits}{Incremental\ Costs + DSM\ Direct\ Costs}$$

Table 4-11: Benefit-Cost Ratio for 2010 Custom Programs

Custom Program Area	Benefit-Cost Ratio
Large New Construction	2.4
Large Commercial	4.2
Multi-Residential	3.8
Agriculture	2.0
Other Industrial	7.7
Total	4.3

Nexant reviewed Enbridge Program results for 2007 and 2009 in order to compare the 2010 results to results for previous years. In 2007, the custom projects benefit- cost ratio overall was about 3.0; in 2009 and 2010, it was about 4.3. For each sector individually, 2010 benefit-cost ratios were about the same as 2009. Compared to 2007, each sectors had a slightly higher benefit-cost ratios in 2009 and 2010. The industrial sector has consistently had the highest ratio and the largest increase from 2007 to 2009. The benefit-cost ratio in 2007 was about 4.3, in 2009 it was 7.5 and 2010 it was 7.7.

The high value for industrial raises concern. We considered three potential causes for this high benefit-cost ratio: poor economic conditions, incorrect (and high) energy savings claimed, and incorrect (and low) project costs reported. Each of these possible causes is discussed further below.

The increasing benefit-cost ratios may be the result of customers implementing only those projects with very favorable economic returns (and high B/C ratios) due to the poor economic conditions. The effects of the economic downturn may have impacted the industrial sector more strongly than other sectors. Enbridge did note in the Draft Annual Report that the industrial sector was impacted by the economic downturn. Although we cannot analytically prove what impact this had on benefit-cost ratios, we believe it to be the most likely explanation.

The accuracy of the energy savings claims were audited in detail as we reviewed the Engineering Review (see Section 5). For the industrial programs, the most significant measures contributing to natural gas savings were furnaces for process heating, industrial process equipment, and heat recovery for process heating or space heating. These top three measures accounted for 33 of 123

participants and more than half of the natural gas savings. Other significant measures included steam traps, ventilation controls, and greenhouse curtains. Based on our audit of the Engineering Reviews of Industrial Custom Projects, Nexant does not find any evidence that savings are being overestimated. In fact, in projects included in the sample, estimates are generally conservative (see Section 5 for complete discussion).

Regarding project costs, the consultant (BJL) who completed the Engineering Review for industrial projects did state that costs were supported with actual contractor pricing specific to each job and in general the Engineering Review found those prices to be in line with industry standards. However, this audit did not include a detailed review of project costs. We recommend that future Engineering Reviews include a more detailed review and discussion of industrial project costs.

Although we suspect the economic effects may be the reason for the high benefit-cost ratios, due to the large impacts of the industrial custom projects, and the exceptionally high benefit-cost ratio for the program, increased attention to this topic is recommended. Enbridge should consider tracking additional program metrics which may provide more information to explain the benefit-cost ratios. We suggest that Enbridge consider tracking the savings per participant and number of projects implemented as a percentage of the projects recommended by Enbridge. Enbridge should consider the required time and effort to track these metrics and weigh the benefits of the additional data compared to the time and effort required. As discussed above, Nexant does recommend that the 2011 Engineering Review include a more rigorous review and discussion of project costs than was done in 2010.

We do not recommend any changes to the 2010 results; the energy savings claimed are reasonable.

4.2.8 Other Industrial Initiatives

Enbridge offered several industrial support programs in 2010 which did not result in measurable gas savings for 2010. Industrial support programs offered in 2010 were:

- METERs (Measuring, Evaluating & Targeting of Energy & Resources)
- Workshops and training
- Funding for on-site energy managers for select large facilities
- Energy assessments

Nexant commends the Company for their efforts providing these types of activities. Nexant does believe that given the current economic environment, driving participation into mature programs is an on-going challenge which does require proactive outreach, training, and technical assistance to be provided to the customer. In the future, Nexant recommends Enbridge make efforts to track

custom projects and the associated impacts which result from these support programs in order to gauge the impact of the programs.

EAC Comments

The EAC asked Nexant to consider the impacts of the on-site energy managers. Enbridge does not claim any savings for the on-site energy managers and did not track projects resulting from the deployment of energy managers. Therefore, it is difficult to assess and provide an opinion regarding the impacts. Nexant recommends, as stated above, that Enbridge consider making efforts to track custom project applications resulting from this or any of the other industrial support programs.

5 REVIEW OF VERIFICATION AND RESEARCH STUDIES

5.1 COMMERCIAL AND INDUSTRIAL ENGINEERING REVIEWS

This section evaluates the review of the third-party Engineering Reviews which were completed for custom commercial and industrial project impacts for the Enbridge Gas Distribution Engineering Review for 2010 by Building Innovation Inc (BII) and Byron J Landry & Associates respectively (BJL).

Thirty-one (31) custom commercial projects were sampled in the BII impact evaluation and they included a wide range of customer facility types including retrofit projects for multi-family condominiums, large offices buildings, hospital retrofits, and a district steam heating plant retrofit. In addition to retrofit projects, several new construction projects were evaluated including a school, a conference center, retail center, new apartment buildings and a water park amusement center.

For the industrial program BJL reviewed a total of 13 projects including two projects in the agricultural sector for greenhouse thermal curtains.

Tasks performed by both BII and BJL included:

1) A review of customer applications, supporting documentation, engineering estimates, simulation inputs and outputs for new construction projects, and commercial or industrial specific eTools model inputs for many of the retrofit projects

2) Site visits to verify that measures were installed and operational

3) Collection of supporting information including operating practice, system operating data and design information from customers and Enbridge files.

4) Reporting on investigations of file reviews and site inspections including recommendations to accept savings claims, or recommendations for adjustments to savings to reflect review conclusions.

5.1.1 Technical Review of Engineering Custom Engineering Reviews

Calculation Methodology Review

Commercial retrofit projects were typically calculated using the commercial version of the Enbridge's eTools, while new construction projects were modeled using the EE4-CBIB simulation software with the exception of a water park amusement center, for which energy savings were calculated using an alternative calculation approach not explicitly identified in the report. Industrial projects reviewed by BJL were typically calculated with spreadsheet calculations, although several projects were calculated with the industrial version of eTools. Energy savings adjustments by BII and BJL were calculated with standard engineering calculations, or through revised inputs to eTools calculation models which were re-run by Enbridge.

However, savings estimates for the majority of the commercial projects reviewed by BII were developed with Enbridge's eTools, and potential issues with the calculations internal to the tools were beyond the scope of the evaluation team's efforts, and of Nexant in this custom project review. New construction projects reviewed in the sample of commercial projects were also calculated using computer simulation models, some of which the reviewer noted did not appear to be consistent with or the latest versions of the building modeling software appropriate for the project. The projects within the industrial project sample group were calculated with tools including Industrial eTools and spreadsheet calculations based on sound engineering principles. Generally these project reviews revealed use of trend data, spot measured or snap shot data from the distributed control system (DCS) screens, and assumptions regarding some of the variables for inputs to the calculation models.

Nexant reviewed the BII and BJL reports on all projects, and requested additional information on a subset of the projects in both the industrial and commercial samples that had been reviewed by the two consultants. Additional data was requested for projects that had savings claims that made up a significant fraction of the sector samples overall claimed savings, where savings were a significant fraction of the baseline gas use at a particular project, where the consultants pointed out significant discrepancies in their review findings from the original project calculations, or where Nexant felt that calculation assumptions, notes on site visit findings or calculation approaches warranted additional investigation. Comments on Nexant's evaluation of the reviewer's calculation methodology for each project are summarized in Table 5-1 below.

Table 5-1: Review of Calculation Methodology for Distribution Contract Projects

Project and Description	Comment
CM.HOS.002.10 AHU Controls to reduce OA fraction from 100%	BII noted that project calculations from the original project review did not account for heat recovery on AHUs, or VSD control of AHU fans. Nexant reviewed the spreadsheet alternative calculation bin model BII used to reassess savings and identified what appears to be an error on the gas heating energy sum; however, the sum is a hard coded number with no formulas to trace back through the spreadsheet. The spreadsheet also uses assumptions about HRU effectiveness and changes due to reduced air flow rates that aren't well supported. Nexant's evaluation of the BII calculations shows that the gas heating savings are strongly affected by the assumed pre- and post-installation HRU effectiveness; even small variations in actual performance from the assumed 85% value will change the gas savings. Nexant agrees that the HRU effectiveness will increase, but suggests that better documentation or verification of this and similar assumptions are warranted. With an adjustment of gas savings of -62% by BII, Nexant does not believe that the magnitude of change resulting from a potential math error or the unsupported HRU effectiveness assumptions will significantly impact the adjusted savings total at the reduced level recommended by BII. Nexant recommends that both the gas and electric savings are reasonable given the VSD control of AHU fans and observed operations, but suggests better documentation or verification of the assumed values is necessary for future project reviews.
CM.MULTI.PRIV.283.10 Install new heating and DHW boiler plants including make-up air controls for residential apartments	Site visit observations by BII indicate that the DHW equipment in use is inconsistent with inputs to eTools; BII reviewer comment is reasonable that the change to DHW from the heating boiler and plate HX during heating season is based on the similar efficiency ratings of the proposed DHW boilers and the new heating boilers. The explanation is satisfactory and savings are reasonable.
CM.MULTI.PRIV.195.10 Install new heating and DHW boiler plants for residential apartments	Savings claimed and reviewed by BII at 32% of total gas use; the BII reviewer suggested no adjustments, and Nexant agrees the estimate is reasonable considering improved annual heating boiler and DHW boiler efficiency estimates calculated by eTools.
CM.OTHER.002.10 Replace lead heating boiler for large office building	Savings claimed and reviewed by BII at 31% of total gas use; the BII reviewer suggested no adjustments, and Nexant agrees the estimate is reasonable considering improved annual heating boiler and DHW boiler efficiency estimates calculated by eTools.

Project and Description	Comment
CM.OTHER.014.10 Install condensing and non-condensing economizers on 8 boilers in district heating steam plant	Nexant asked for additional documentation on this project review because a significant fraction of the total gas savings for the commercial project sample was from this project. In the BII project review, they noted that the observed firing rate was higher than input to the eTools; this suggests that savings recommended by BII are potentially slightly higher, but the reviewer chose not to adjust gas savings as the conservative approach. Also noted by BII, additional gas savings are likely from elimination of steam pumps (savings not claimed), but additional electric use for new pumps was calculated. Nexant concludes that the BII review is reasonable and their conclusions are valid given the conservative approach and minor impact of the steam pump energy savings and variation in firing rate on the savings results.
CM.MULTI.PRIV.017.10 Ventilation and AHU controls including new supply air temp, and scheduling of VSD fan control	The BII savings adjustments for this project appear to be related primarily to operational changes to AHU VFD settings from the condo operators based on mould noted on the 7th and 8th floors. A letter sent to Enbridge confirmed a re-scheduling of the MAU fan speeds, but not according to the original design. The BII reviewer requested a new eTools run to reflect the new VFD fan schedule. Nexant agrees that the explanation is reasonable for the significant gas and electric savings adjustments by BII.
CM.MULTI.PRIV.129.10 Heating and DHW boiler controls and MAU and AHU controls for residential apartments	Gas savings claimed for this project are primarily associated with scheduling of MAU and AHU VFD controls to reduce fan flows with additional savings related to changing to intermittent pumping for heating and DHW boilers. Savings were adjusted by the BII reviewer for heating boiler and DHW jacket temperature reductions outside of eTools as the reviewer felt that the 40 deg F temperature drop was excessive. The reductions in gas savings are relatively minor (approximately 3,000 m3/year), but indicates a potential modeling problem with the eTools in calculating the reduction in jacket losses from intermittent boiler operations. Nexant recommends that Enbridge review this modeling issue in eTools for improved modeling accuracy. The BII reviewer's explanation of the adjustment to savings is reasonable.
CM.MULTI.PRIV.052.10 Install new heating boilers and condensing DHW boilers with VFD controls for AHU ventilation for residential apartments	Overall gas savings were a significant fraction of weather normalized gas use, but calculated annual efficiency differences between existing and new boilers provide reasonable case for savings. The BII reviewer required no adjustments of savings from eTools, and Nexant agrees with the assessment.

Project and Description	Comment
ALL.008.1 Install Regenerative Thermal Oxidizer to destroy VOCs and odors from facility exhaust	The project includes installation of a regenerative thermal oxidizer (RTO) to destroy VOC's and odors in exhaust gasses. The new process in the facility required either extensive modifications to the existing non regenerative system, or installation of the new efficient RTO system. The gas savings claims seem well supported and the calculations appear to be consistent with on-site observations by BJL with the exception of the calculation of post-project implementation gas use by the RTO. BJL noted that during their site visit with ambient temperatures at -5 degrees C the gas valve was off and the burner was not operating. BJL further notes that the post-install gas consumption was conservatively estimated to operate at minimum fire rate during similar conditions and concluded that the post-install gas consumption was probably less than the calculated value. However, the potential increase in savings would be less than 1% of the claimed savings, and BJLs reviewer recommended no adjustments to the project savings. Nexant agrees that the savings are likely slightly conservative, but also likely well within an overall uncertainty level of the individual variables including mass flow, temperatures, and chemical loading of exhaust air in the RTO. Nexant agrees that the savings claim and BJL's recommendation to accept the original savings claim is reasonable for this project.
ALL.043.10 Install thermo compressor to recycle and re-compress blow-through steam for Yankee dryer in tissue paper making machine	This thermo compressor project to recompress blow through steam in a Yankee dryer used to make tissue paper is well documented by the original project consultant for steady state calculations of steam flows and steam savings from recycling of the blow through steam. However, the facility appears to have varying levels of steam flow and steam recovery through the thermo compressor as noted in the BJL project review. BJL consultant noted that the most recent 4-month period was not factored in when observed steam flows were in the 4700-5100PPH range, as much as 8% greater or 1% less than the calculated assumed steady state steam rate. Although the conservative estimate is easily supportable for the savings claim, Nexant believes the higher steam flows noted by BJL on the recent 4-month trend suggest savings are actually somewhat higher than the savings claimed. On the basis of the information presented by the original consultant and BJL, the claim is reasonable, albeit conservative.
ALL.093.10 Austenizing furnace redesign for side loading and heat loss control	The first of two projects to change the design of austenizing furnaces to side loading to minimize heat losses is well documented by the original project consultant as to the heat and mass balances once the full production occurs. However, BJL's evaluation of this project was based on projected production rates in tons/year of pipe that had not yet been achieved as of the project review time period. BJL notes that the calculations were reviewed and were reasonable, and that based on the facility projections for ramping up of production the predicted savings level would be reached in mid year. The report, however, is not clear on the level of production during the review period, or the savings at the lower production rates that were occurring during the review period. The original consultant's savings approach appears to be sound and reasonable, but savings claims based on future production rates suggest that this project should be revisited after the furnaces are fully commissioned and actual savings can be documented based on demonstrated production rates. For the 2010 impact evaluation, Nexant recommends accepting the savings claim without adjustment based on the facility projections of production ramp-up.
ALL.095.10 Austenizing furnace redesign for side loading and heat loss control	See comments above for companion project.

Based on our review of the verification reports and the supplemental information made available during this audit, the verification contractors appear to have completed an accurate evaluation. The methodologies used by BII and BJL to assess the energy savings claims in the Enbridge project files are mostly well explained and documented in the report.

Both BII and BJL did conduct site inspections for all the projects involved and were able to verify the accuracy of the operating or design parameters used for the savings calculations. In a number of the project reviews the energy savings estimates were revised based on observed conditions or operating profiles that were significantly different than shown in the original savings calculations. There were also a number of references to information obtained through conversations with plant and facility personnel discussing scheduling of VFDs for air handlers, loading of boilers or similar situations that might have impacted the reviewer's evaluation of the savings claims. Information from these conversations and discussions were incorporated into savings adjustments, and noted in the individual project discussions.

The overall quality of the BII and BJL verification reviews does vary between projects and between the commercial and industrial programs. This is particularly true with projects evaluated with EGDs eTools, since the calculations performed in the eTools are not visible to either Nexant, or BII and BJL. However, each project appears to be evaluated fairly and the project reviewer used the information provided to assess the accuracy of the reported gas savings. Although this audit did not obtain all the relevant data (e.g. site inspection notes and eTools calculator for example) to perform a due diligence check all of the assumptions used in the savings calculations for each project, we did not identify reasons that would suggest the reviewer's due diligence reviews were insufficient. No savings adjustments for projects in either the commercial or industrial programs are recommended at this time.

5.1.2 Review of Custom Project Sampling Methodologies

This section provides a review of the sampling methodology for the Engineering Reviews of Custom Commercial Projects.

Relevant background documents reviewed were:

- *Sampling Methodology for Engineering Reviews of Custom Projects* dated April 3, 2008 (final report)
- *Proposed Sampling Method for Custom Projects* dated October 31, 2008 (Memorandum)
- *Memorandum on Enbridge Sample Selection for 2008 CI Projects - Wave I 2008-12-19* (Memorandum)

The document reviewed in detail which specifically relates to the 2010 results was:

- *2010 Custom Random Sample_SAS Summary _Final* (Final Report)

Sampling Methodologies

The sampling methodology used to draw the second of two sample batches is documented in the SAS Sampling Report and is based on a series of sampling reports and memos produced by Summit Blue in 2008, noted above. It is assumed that SAS followed the methodology outlined by the October memo to select the first sample batch from Q1-Q3 projects. The SAS Sampling Report specifically references the December memo, which builds upon the other two Summit Blue documents, to select the second sample batch from Q1-Q4 projects (excluding those projects selected in the first sample batch). The October memo specifically recommends this two-step (or two batch) sample selection process to allow better overall results by allowing additional calendar time to perform verification work.

The April report builds a defense for flexible confidence and precision levels that cater to the needs of the utility by carefully considering the value of the program and the cost of verification. Accordingly, the April report states that statistical expectations between 90/20 (90% confidence and 20% precision) and 80/20 are sufficient for a custom program. With this guideline, the April report and October memo set the confidence and precision target at 90/15 with a caution that results may be closer to 90/20, depending on the specific characteristics of the program. Our experience has been that 90/10 is preferable for custom programs, which tend to have highly variable results, especially considering the large percentage contribution from the custom program to the overall Enbridge portfolio. Considering the history of the program and sampling methodologies approved in the past years, the current statistical expectations are sufficient based on currently available verification budgets. Although we did not review in detail the current annual verification budgets compared to total DSM budgets, it appears that increased attention to verification is warranted. Nexant recommends that Enbridge consider allocating more program budget to verification in order to increase precision levels to 90/10.

The SAS methodology outlines a stratification technique to verify savings for gas projects and electricity projects simultaneously, ensuring that the sample is representative of the population and improving the relative precision estimates by intelligently stratifying the population. Continued use of stratification is recommended to improve the efficiency of the sample design. For the fourth quarter sample, the industrial sector was stratified into three stratum and the commercial sector into six stratum.

As agreed upon with Enbridge and the EAC, water projects are a separate sampling stratum for industrial projects but not for commercial. This issue has been discussed with previous auditors and the EAC, and Nexant finds no issue with there being no separate strata for sampling commercial water savings; the number of commercial projects with water savings remains very low.

Custom Program Sampling Results Achieved

A summary of the actual sample selected is shown in Table 5-2. The actual samples selected for each batch were taken from Tables 8 and 9 of the SAS Sampling Report and the actual samples selected overall by stratum were taken from Tables 6 and 7 of the SAS Sampling Report. Overall, 44 samples were selected, surpassing the target number of 35 listed on page 5 of the October memo.

Table 5-2: Planned and Actual Sample Design for the Custom Program

Stratum	Batch 1 (Q1-Q3)		Batch 2 (Q1-Q4)		Total	
	Planned	Actual	Planned	Actual	Planned	Actual
Industrial – Top Electric	N/A	4	1	9	3	1*
Industrial – Top Gas	N/A		2		3	6
Industrial – Remaining Projects	N/A		3		6	6*
Building Retrofit – Top Electric	N/A	5	1	6	3	2*
Building Retrofit – Remaining	N/A		2		4	9
Multi-Family – Top Electric	N/A	7	2	6	2	3
Multi-Family – Remaining	N/A		2		4	10
New Construction – Top Electric	N/A	1	2	6	3	1*
New Construction – Remaining	N/A		2		4	6
Water	N/A	N/A	2	N/A	N/A	1
Other	N/A	N/A	N/A	N/A	3	N/A
TOTAL	**13**	**17**	**26**	**27**	**35**	**44**

Overall, 44 samples were selected for a sample design requiring only 35 samples. However, although SAS oversampled overall, some of the stratum requirements were not met. These fields are marked with an asterisk. The significance of under-sampling at the stratum level may be insignificant, considering that sample sizes overall were sufficient and the sample design may have been modified.

It must be noted that the Summit Blue methodology was developed for the custom program in 2008 for a particular population size. Due to a potential difference in population sizes, following the Summit Blue sampling methodology may not yield results within expected precision bounds. Assuming that simple random sampling was used with a coefficient of variance of 0.5, a sample size of 44 projects out of a total population of 639 projects yields a precision of ±12.0% at 90% confidence. However, realization rates were in fact applied separately for commercial and industrial programs. There has been no analysis of the achieved confidence levels for the commercial and

industrial adjustment factors of the 2010 sample. Nexant recommends that Enbridge ensure that the actual achieved confidence and precision levels for gas, electricity, and water savings for both commercial and industrial programs are calculated moving forward (in total, up to six confidence intervals). Even though the Summit Blue methodology has been accepted, we believe that continued review of the actual achieved precision levels is critical in order to make decisions moving forward regarding use of the sampling methodologies and the results achieved.

The April report states a requirement of the OEB that "the projects selected for assessment should consist of a random selection of 10% of the large custom projects representing at least 10% of the total volume savings for all custom projects and consist of a minimum number of five projects."[2] The sampling methodology outlined in the Summit Blue documents was designed to meet this criterion. 64 projects must be sampled to meet this requirement for a population of 639 projects. However, this requirement is intended for large custom projects only and it is not clear which of the 639 projects fall into this category. In addition, the sampling methodology specified that some projects may have been combined, making it difficult to recreate the population from which the sample was drawn. It is recommended that in 2011, the contractor hired to determine and draw the sample set determine and report that that the OEB's requirement was met.

5.2 RESIDENTIAL PROGRAMS VERIFICATION REPORTS

This section provides a review of the verification reports conducted for Enbridge Gas in 2010 for residential programs. The following Verification Reports were reviewed:

- TAPS Mail Insert Test Final 20110125
- Showerhead Verification Among Rental Buildings Research Report
- Regular TAPS 2010 Year End Report 20110302
- Low Income TAPS 2010 Year End_Report_20110302
- ESK Building Verification Program Report 20110224

5.2.1 Review of Report Content

The results of these Verification Reports are used to calculate reduction factors to discount deemed savings and costs due to factors such as product removal rates. For a discussion of how the results applied to each individual program, see Section 4.1 above.

[2] EB-2006-0021, Decision With Reasons, Ontario Energy Board, page 45-46

Generally, Nexant finds that this research resulted in usable results that increase the accuracy of Enbridge's claimed gas savings, and Nexant encourages these efforts to continue. However, we recommend several improvements to the Verification Reports:

- Contractors should use consistent significant digits throughout each verification effort. Nexant found that rounding of values was not done consistently. Although rounding errors are small, when applied to large programs the impacts could be significant.

- Contractors should be required to calculate the final reduction factors that Enbridge can apply to program results as they are tracked. Currently, Enbridge interprets the Verification Report results to calculate reduction factors. During the Audit, Nexant checked the reduction factor calculations and found that incorrect interpretation of the Verification Reports lead to incorrect reduction factors in several cases. This problem is understandable as the contractors are not involved in Enbridge reporting, nor are Enbridge staff involved in the execution of the Verification work. If Enbridge staff communicate to the contractors how Enbridge plans to use the results, contractors can calculate the exact reduction factor application to the participant population.

5.2.2 Review of Sampling Methodologies

Enbridge noted that though no formal sampling approach had been adopted for the programs, contractors aim to achieve a 90/10 confidence and precision level at the program level.

For these programs, verification was performed by telephone survey. Confidence and precision levels were reported by the evaluation contractor at 95% confidence while assuming a coefficient of variance of 0.50 for all programs except the showerhead verification study, which reported results at 90% confidence. Confidence and precision levels calculated by the contractor and verified by Nexant are shown in Table 5-3. The coefficient of variance is assumed to be 0.5 and we find this assumption reasonable.

The Showerhead Verification report used a technique called cluster sampling, in which random sample of "clusters" was selected. Then for each cluster, a random sample of units was selected. For the purposes of this program, a cluster was a residential complex and a unit was a residential unit.

Nexant compared the program populations in the verification surveys to those from the TRC/SSM spreadsheet. In many cases, the results of the verification surveys (reduction factors) were applied not only to the population of projects from which the random sample was drawn, but also to other projects outside of that population. The additional participants to which the results were applied are noted in Table 5-3. There are three different reasons that this occurred:

- Unusable records: Participant records were unusable for the phone survey (i.e. phone numbers bad)

- Late completion: Project completion was after survey start. Surveys are done before the 2010 program is closed out because survey results are required in order to incorporate the results into SSM calculation.
- 2009 participants: Project was installed in 2009 and therefore not included in 2010 survey, but project paperwork was received in 2010 and reported in 2010 Annual Report

Table 5-3: Confidence and Precision Levels of Verification Reports

Program	Sampled Population	Sample Size	Confidence and Precision	Additional Participants outside of Sampled Population
TAPS Mail Insert	531	150	95% ± 6.7%	10 unusable records or late installation
Multi-Residential Showerhead	11,705	662	90% ± 8.0%	~5,000 2009 participants ~1,500 late installation
Regular TAPS	143,831	3,201	95% ± 1.7%	~7,000 unusable records
Low Income TAPS	283	57	95% ± 11.6%	
New Construction ESK	370	150	95% ± 6.2%	~1,300 late installation

Because these additional participants were not included in the random sample, the samples are not representative of the program population to which the results (reduction factors) are applied. We find that using the results of the verification surveys to calculate reduction factors is the best available information for the 2010 Annual Report, and therefore suggest no adjustments to the results. However, for future work Nexant recommends that the consultants completing this verification work analyze the effects of un-sampled participants on the confidence and precision levels and make adjustments to sampling strategy in order to ensure that the target 90/10 confidence and precision level is achieved.

5.3 RESEARCH REPORTS

5.3.1 Steam Trap Measure Life Research

Both the 2008 and 2009 Auditors recommended that Enbridge complete research to substantiate the steam trap measure life assumption. The current measure life (valid through 2010) is six years. Enbridge completed a Steam Trap study in 2010. The study included a third party literature review and a study of available information from steam trap audits completed through Enbridge's Custom programs.

Nexant reviewed the three documents provided as part of the report review:

- The Steam Trap Measure Life Analysis Report, completed by Enbridge,
- Appendix A –Steam Trap Measure Life Analysis (from the Enbridge report), and

- Literature Search and Review - Failure of Steam Traps prepared by the Université du Québec's École de Technologie Supérieure

The literature review covered 74 sources; however, only 16 sources that contained useful and/or relevant information were identified. Of these, the overwhelming majority was at least 10 years old, with one 35 year old source. The most recent identified sources were two reports dating from 2002. No work completed after 2002 was found. Only two of the 16 relevant references reviewed were studies that presented failure rate curves. Due to age of one article and the use of a manufacturer's proprietary software in the other, the supporting data was unavailable for review by the researchers.

One Armstrong international article [1] studied showed steam trap useful life varies with both type of steam trap and conditions under which the trap is used. Mean time to failure ranged from a low of 3 months (3-12 month range depending on model) for high pressure steam systems (650 psig) using bimetallic thermostatic traps to 15 years (range of 12-15 years) for inverted bucket type traps operating on low pressure systems (30psig). Unfortunately, the article is aged, and no data could be located to back up the conclusions from the table.

The literature review points out the importance of not using general failure rate curves for any type of steam trap, stating "such curves should be based on extensive test results conducted for different type of steam traps and for different operating conditions." However, the review concludes that these extensive test results are not available and therefore general curves are used.

The literature review concludes that there is no credible, publicly available research that can be used to adequately defend the choice of a single steam trap average useful life and the only generalized claim made is that inverted bucket traps typically have longer useful lives than disk types. Nexant finds that the literature review was thorough. The fact that little information was found in this literature research reflects the fact that well-supported, industry standard information regarding steam trap measure life is difficult to come by.

In the Enbridge *Measure Life Analysis (Appendix A),* Enbridge identified customers who had participated in steam trap audits since 2000, and selected a sample of six sites out of 20 for a total sample set of 82 steam traps. All 82 steam traps had been audited and replaced on year zero and revisited at least three times in subsequent audits and were identified/numbered.

[1] *Choosing a Better Steam Trap*, Trap Magazine, Armstrong International, 1993.

Curve fits were generated to fit the frequency of failure at each site for each year of the study, and R-squared statistics were generated to rate the "goodness of fit". The R-squared statistics depend on an assumption of normal distribution of the underlying failure rate data, and with such a small sample size, the statistics may lack significance. Therefore the conclusions from audit data on the failure frequencies inherently contain a large measure of uncertainty. Although the Enbridge summary report does echo the literature review conclusions in a generalized sense, the measure analysis uses a small sample of data to conclude that a five year measure life is warranted, without a concurrent description of the trap-type studied, or the system pressure assumed. In the analysis and report, there was no discussion of homogeneity involved in the six sites, or within each site, either in terms of trap type, or steam pressure and steam flow rates. Enbridge states that the types of steam traps included in the study as well as the facility operational characteristics were varied throughout the sample, but specific information on the distribution of steam trap types and applications was not made available during this audit.

This work is commended by Nexant. Having empirical evidence of steam trap failures rates, despite the limitations of the study, is strong information, especially given the scarcity of data from the literature review. The information is specific to Enbridge's service territory and based on well documented failures. Nexant recommends that the measure life for steam traps was adjusted to five years for the 2010 LRAM calculation. The impact on LRAM and TRC Target calculation is included in Table 2-2.

However, Nexant also suggests improving the conclusions of the measure analysis by providing additional details regarding the types of steam traps included in the analysis, and the steam pressures associated with the traps studied. In addition, Nexant recommends including statistical significance of the results in the reporting.

Enbridge plans to dedicate efforts to follow-up steam trap studies, and Nexant encourages these efforts. Collection of additional information will expand the sample size and, for sites that are repeat participants, it will increase the overall time period covered by the data (currently the maximum number of years between the first observations and the final observations available for the study is six years).

5.3.2 Boiler Study

A research project regarding boilers is underway. However, results were not available for this Audit Report.

6 REVIEW OF FINANCIAL MECHANISMS AND TRC TARGET

6.1 SHARED SAVINGS MECHANISM (SSM)

Nexant reviewed the SSM calculation in the 2010 Draft Annual Report and found that the calculation was accurate and in accordance with OEB SSM Guidelines. The SSM calculation and final audited value is shown in Table 6-1.

Table 6-1: SSM Calculation

	Original Value	Audit Adjusted Value
2010 Actual TRC	$184,565,726	$,184,593,043
2010 TRC Target	$202,342,433	$202,342,433
Percent of Target	91%	91%
Base Target	75%	75%
Percent over 75%	16.21%	16.23%
$ per 1/10 of 1%	$10,000	$10,000
SSM at 75% of Target	$2,250,000	$2,250,000
SSM over 75% of Target	$1,621,454	$,1622,804
Program Total	**$3,871,454**	**$3,872,804**
Market Transformation	$282,484	$282,484
Total SSM	**$4,153,938**	**$4,155,288**

6.2 DEMAND SIDE VARIANCE ACCOUNT (DSMVA)

Nexant reviewed the DSMVA calculation in the Draft Annual Report and found that the calculation is accurate. The amount reimbursable to ratepayers is $2,717,105 as stated in the Draft Annual report.

The 2010 Actual Costs used in the DSMVA calculation were correctly based on a sum of the Direct DSM Costs and Incentives reported from the Company's financial reporting system. Nexant's review did not include accessing the financial reporting system or auditing the financial record keeping.

The 2010 Budget used in the DSMVA calculations were correctly based on OEB approved filings. The 2010 Filing included the budget for all programs except the low-income programs. The low income program budget was correctly based on the OEB approved low income plan which was filed separately.

A $1,250,000 credit is applied to the DSMVA because an Industrial Pilot Program was originally proposed in March 2010, and the cost of that program was included in the DSM Y Factor. In May 2010, the OEB decided not to approve the Industrial Pilot Program. Therefore, the program cost would be reimbursed to the ratepayer as a credit in the 2010 DSMVA. A full explanation of this issue

is provided in the Annual Report; Nexant's audit confirmed that the $1,250,000 credit was applied to the DSMVA.

6.3 LOST REVENUE ADJUSTMENT MECHANISM (LRAM)

Nexant reviewed the LRAM calculation to determine that lost revenue was calculated in accordance with OEB guidelines.

The annual savings reported for each project were discounted to calculate the actual impact on 2010 revenue. This was done using the turn-on month (installation month) for each project and calculating the savings realized in 2010. The result is an *Actual Net Partially Effective* savings value in m3.

The *Actual Net Partially Effective* savings realized in 2010 is compared to the savings budgeted and accounted for in customer rates in 2010. Both the Budget and Actual savings were calculated individually by Rate Class.

The difference between the Budget and Actual savings is defined as the *Volume Variance.* That variance is then used to determine if payment is due to the ratepayers or if there is additional revenue not accounted for in 2010 rates to be collected. The amount of the LRAM payment is determined using a distribution margin (cents per m3 natural gas) based on Decision 2010 EB 2009-0172 as approved by the OEB.

Table 6-2 2010 LRAM Calculation, Excluding Rates 1 and 6

Rate	Budget Net Partially Effective (m3)	Actual Net Partially Effective (m3)	Volume Variance (m3)	Q1 Distribution Margin (cents/m3)	LRAM
Rate 100	0	1,127,498	(1,127,498)	3.6820	$ (41,514)
Rate 110	2,142,630	1,306,345	836,285	1.6410	$ 13,723
Rate 115	1,363,492	609,733	753,758	1.0496	$ 7,911
Rate 135	0	40,685	(40,685)	1.4409	$ (586)
Rate 145	1,940,562	1,263,175	677,386	1.8752	$ 12,702
Rate 170	4,563,402	3,095,771	1,467,631	0.6207	$ 9,110
Total	**10,010,086**	**7,443,208**	**2,566,877**	**-**	**$ 1,346**

In reviewing the LRAM calculation, we found that:

- No LRAM was applied for the gas savings related to Rates 1 and 6. (Natural gas savings under Rates 1 and 6 include some participants from each sector, and all participants from the residential and small commercial sectors.) No LRAM was applied for these rates because

a true-up variance account (AUTUVA) mechanism is used in place of LRAM. The AUTUVA mechanism is accounted for at the beginning of each year. Nexant did not review the AUTUVA mechanism calculations but based on discussions with Enbridge and the EAC, use of the AUTUVA mechanism was agreed upon during previous audits.

- The Rate 100 and 135 LRAM were calculated using a Budget Net Partially Effective Value of zero. The reason for this is that Rate 100 and 135 customers were expected to migrate to Rate 6 and 145, respectively, therefore no natural gas savings were expected on Rate 100 or 135 and the rates did not account for any lost revenue associated with DSM programs.

- The Rate 100 LRAM was calculated using the distribution margin for Rate 6.

The above points were discussed with Enbridge and the EAC. Nexant finds that Enbridge's calculation of LRAM is accurate, and the amount reimbursable to rate payers is $1,346.

6.4 2011 TRC TARGET

Nexant reviewed Enbridge's 2011 TRC Target calculation. A *Preliminary TRC Target* was calculated per OEB approved methods. Nexant found that the calculation of the TRC target correctly adjusted 2008, 2009, and 2010 net TRC benefits results using 2011 avoided costs. The Preliminary Target was an average of the three values, escalated by a percentage. The calculations are summarized in Table 6-3.

The preliminary TRC Target was adjusted to arrive at a final 2011 TRC Target. The adjusted calculation was per an agreement included in the 2011 Plan filing and approved by the OEB. The adjusted calculation is required because low income programs are being moved to market transformation, and will no longer be included in resource acquisition (and therefore calculation of net TRC benefits) beginning in 2011.

Nexant reviewed the calculation of the Final TRC Target and found that it is per the agreed upon calculation.

Table 6-3 2011 TRC Target Calculation

2008		2009		2010		2011	
Audit SSM TRC Results	TRC results for LRAM with Final 2011 avoided costs	Audit SSM TRC Results	TRC results for LRAM with Final 2011 avoided costs	Audit SSM TRC Results	TRC results for LRAM with Final 2011 avoided costs	Preliminary Target	TRC Target per Settlement
A	B	C	D	E	F	=(B+D+F)/3 * 1.075%	
$182,706,679	$146,216,779	$215,833,455	$130,533,176	$181,120,630	$135,620,896	$147,766,222	$139,493,103

6.5 MARKET TRANSFORMATION INCENTIVE

Nexant reviewed the Drain water Heat Recovery Market Transformation Scorecard and found that Enbridge followed the OEB approved scorecard evaluation approach. The scorecard assigns a weighted value to two performance metrics: ultimate outcomes (80% of total score) and program performance (20% of total score). The ultimate outcomes metric depended on *Units Installed* which was defined as the percentage of 2010 housing starts across all builders. The program performance metric depended on *Builders Enrolled* which was defined as the number of first time new builders enrolled in the program. For the evaluation scorecard, results were calculated with the understanding that all of the reported results would have a maximum value of 150% of the reported outcome. Nexant's verification of the calculations is shown in Table 6-4. For 2010, the Drain Water Heat Recovery program was eligible for a total SSM Incentive of $500,000.

Table 6-4: Drain Water Heat Recovery Market Transformation Scorecard

Element	Weight	50% Goal	100% Goal	150% Goal	Reported Outcome	Result	MT SSM Incentive
Ultimate Outcomes *Units Installed*	80% ($400,000)	*% of housing starts(units installed)*			*% of housing starts (units installed)*	*% of goal*	*(6.6%/10%)*50%*$400,000*
		10% (2,542)	13% (3,305)	16% (4,068)	6.6% (1,684 units)	< 50%	$132,484
Program Performance *New Builders Enrolled*	20% ($100,000)	*New Builders Enrolled*			*New Builders Enrolled*	*% of goal*	*1.5*$100,000*
		15	20	25	42	>150%	$150,000
					Total SSM Incentive		**$282,484**

Appendix A AUDITOR WORK PLAN

Independent Audit of Enbridge Gas Distribution 2010 DSM Annual Report

Auditor Work Plan



submitted to:
Enbridge Gas Distribution
April 25, 2011

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Auditor Work Plan

The objective of the audit is to provide an independent opinion as to the reasonableness of the Company's claims regarding DSMVA, LRAM & SSM.

Task 1 Review of Custom Project Engineering Reviews

Nexant will conduct a thorough review of the final reports on Enbridge's Industrial and Commercial custom projects. Nexant will provide an opinion as to the quality of the review and on the reliability and reasonableness of the error ratio (and/or realization rate) when applied to a larger population of custom projects. We will communicate with those firms contracted to collect necessary project information to provide this opinion. Enbridge will coordinate communication between Nexant and the firms.

Task 2 Kick-Off Meeting

The project kick-off meeting was conducted on February 9, 2011, with follow-up meetings at the Enbridge offices on February 10.

Task 3 Prepare Draft and Final Work Plan

The draft Work Plan is provided herein. The Final Work Plan will be provided one week after the 2010 DSM Annual Report is available to Nexant, or April 8, 2011, whichever is later.

Task 4 Audit 2010 Annual DSM Report & Report Deliverables

The objective of this Task is to ensure correct calculations using reasonable assumptions, based on data gathered and recorded using reasonable methods and accurate in all material respects and applicable to the 2010 DSM programs. This task includes review of supporting deliverables including the 2009 and 2010 Annual DSM Reports, EAC and other stakeholder comments on 2010 Annual DSM Report, and the 2009 EAC DSM Audit Summary Report.

Nexant will prioritize programs by relative impacts in portfolio (largest programs being of most importance) as well as participation trajectory (programs which are growing being more important than those being phased out).

Through initial review of background documentation, feedback received during the kick-off meeting with Enbridge and EAC, and discussions during the Nexant's Enbridge site visit, initial focus areas have been established. The following topics have been highlighted for consideration during the audit:

- Low-flow showerhead programs
    - Builders' Energy-Savings Kit Verification Research Report results
    - Low Income TAPS Partners Program Research Report results
    - TAPS Partners Program Research Report results

    - Showerhead Verification among Rental Buildings Research Report results
    - Measure life assumptions
    - Use of "bag test" for flow rate
    - Alternatives to "bag test" for flow rate
    - Use of quasi-prescriptive approach
        - If Company is using an approach wherein the baseline showerhead flow rate is a weighted average of the high- and medium-flow showerhead flow rates, assess implications for TRC. Consider if weighted average baseline flow rate is reasonable.
        - Consider if Company's approach to baseline flow rate assumption is valid in the context of the results of previous showerhead research conducted by Company.
- Pre-rinse spray nozzle input assumptions
    - Recommend if any changes to current input assumptions are justified based on available data
- Use of quasi-prescriptive approach versus prescriptive approach
    - Provide opinion on current industry best practices
    - If identified, flag prescriptive measures which should be considered by Company for a quasi-prescriptive approach
- Boiler Efficiency Study (if available before completion of Audit)
- Steam Trap Study (if available before completion of Audit)
- Energy Recovery Ventilators/Heat Recovery Ventilators
    - Provide opinion if more reliable data is available on balance points
- Portfolio net-to-gross assumptions
    - Applicability of Custom Program net-to-gross assumptions substantiated by the 2008 Sumit Blue study to the current Custom program design
    - Appropriateness of net-to-gross values used for SSM calculation
    - Appropriateness of net-to-gross values used for LRAM calculation (best available information)
- CFL distribution rates for ESK and TAPS Programs (confirm that CFL distribution rates are correctly based on participant survey results)
- Accuracy of participation level reporting, with a focus on prescriptive measures
- Appropriateness of Company's internal protocol for determining if measures/projects are analyzed as equipment advancement or replacement

Additionally, Nexant will provide insight into program design and implementation issues which, while not of immediate significance to the 2010 Annual Report, may affect the Company's programs in the long term. These questions will be examined to the extent possible within the audit timeline and cost requirements:

- Are research funds being focused in the most appropriate areas?
- How can participation levels in Prescriptive programs be increased?
- Should the quality control process for Custom projects be changed?

- What best practices in program design can be implemented to enhance Enbridge's programs?

Task 5 Verify Claimed Savings and Associated Calculations

Task 5 will be concurrent with Task 4. In order to verify the accuracy of the 2010 Draft DSM Annual Report's calculation of TRC and associated metrics, we will complete a detailed review of the following:

- All DSM evaluation and research conducted during 2010 (see Tasks 1 and 4 above)
- EGD's reporting on program metric results used to support the Market Transformation incentive
- Program tracking methods and results
- Participation results
- Individual measures (both prescriptive and custom) assumptions and results (savings, measure life, free-ridership, costs)
- Methodology and assumptions used to calculate LRAM, DSMVA, MT incentive, and SSM amounts
- Program costs (Nexant will check program costs used in DSMVA calculation against those reported in the program TRC calculation spreadsheet)
- Compliance with the requirements of the Board approved methodology
- Inputs to, and results from, cost-effectiveness models used to calculate net benefits

Task 6 Prepare Draft Audit Report

The Audit Report will outline the principles of the Audit and the Audit processes and methods. The report will document all findings and make recommendations for additional research, evaluation, and/or program tracking activities that may be conducted in the future to reduce uncertainties identified and not resolved as a result of the audit. Additionally, we understand that Enbridge and the OEB may request a recommendation from Nexant to help prioritize program measures to be reviewed in 2011.

Task 7 Prepare Final Audit Report

Based on the input received during presentation of the first two report drafts, Nexant will present a final Audit Report per the project schedule in Table 1.

Current Project Schedule

Table 1 Project Schedule as of April 21

Task	Start	End	Milestone
1 Custom Project Engineering Reviews	25-Jan-11	13-May-11	
2 Project Kick-Off Meeting (Enbridge Office)			Kick-Off: 9-Feb-11
3 Prepare Draft Work Plan	1-Mar-11	8-Apr-11	Draft Work Plan Available: 1-Apr-11
Review Draft Work Plan with EAC			Meeting: 7-Apr-11
2010 DSM Annual Report Circulated			Annual Report Available: 14-Apr-11
Comments on Annual Report, EAC and Consultative			Comments Available: 21-Apr-11
Finalize Detailed Work Plan	7-Apr-11	18-Apr-11	Final Work Plan Available: 25-Apr-11
4 Review Available Supporting Documentation	1-Mar-11	27-May-11	
Audit 2010 Annual DSM Report and Deliverables	1-Apr-11	27-May-11	
5 Verify Claimed Savings and Calculations	1-Apr-11	27-May-11	
6 Discuss Initial Audit Findings with the EAC			Weekly Meetings begin: 21-Apr-11
Generate and Deliver Draft Audit Report #1	1-Apr-11	27-May-11	Draft Audit Report Available: 27-May-11
Review Draft #1 with the EAC	1-Jun-11	2-Jun-11	1st Meeting: 1-Jun-11 2nd Meeting: 2-Jun-11
Revise and Deliver Draft Audit Report #2	28-May-11	3-Jun-11	Draft Audit Report Available: 3-Jun-11
Review Draft #2 with the EAC			Meeting: 15-Jun-11
7 Revise and Deliver Final Audit Report	15-Jun-11	17-Jun-11	Final Audit Report:17-Jun-11

Appendix B COMMENTS ON 2010 DRAFT DSM ANNUAL REPORT

During our review of the 2010 Draft DSM Annual Report, Nexant made the following observations:

- **Page 8.** TAPS and ESK program descriptions do not mention quantity or rating (flow rate and wattage) of distributed device. The program descriptions would be clearer to the reader if that was included. E.g. (4) 13W CFL bulbs, (1) Low Flow Showerhead rated at 1.25 GPM flow and (2) faucet aerators, (1) bathroom and (1) kitchen, rated at 1.5 GPM flow.
- **Page 9.** Does Table 3 reflect the number of households as the note below the table states? We understand that some individual TAPS items were tracked by units delivered.
- **Page 9.** Table 3 includes a row titled "TAPS Partners Program over 2.5 GPM". This title should be changed to "TAPS Partners Program *Showerheads* over 2.5 GPM" for clarity.
- **Page 12.** ESK program description should be corrected: (4) aerators, (1) kitchen and (3) bathroom, are provided. The current description, 3 aerators, (1) kitchen and (2) bathroom, is incorrect.
- **Page 12.** The program description does not mention the rating for each item. The program descriptions would be clearer to the reader if that was included. E.g. (8) 13W CFL bulbs, (2) Low Flow Showerheads, (1) rated at 1.25 GPM and a handheld showerhead rated at 1.5 GPM and (4) faucet aerators, (3) bathroom and (1) kitchen, rated at 1.5 GPM flow.
- **Page 13.** Table 5 lacks a note clarifying tracking units for ESK program.
- **Page 14.** LI TAPS program description should be corrected. LI TAPS is not equivalent to the Regular TAPS program plus a programmable thermostat as stated. Programs offer different CFLs and should be described independently, e.g. (2) 13W CFL bulbs, (2) 23W CFL bulbs, (1) Low Flow Showerhead rated at 1.25 GPM and (2) faucet aerators, (1) bathroom and (1) kitchen, rated at 1.5 GPM flow.
- **Page 15.** Showerhead load results and gas savings changes were not new to 2010 program. The lower per unit TRC results on showerheads was applied to 2009 LRAM results as well.
- **Page 53.** In the first bullet, the last sentence should read "0% of households said they removed their programmable thermostat in 2010." 2009 is written in the report.
- **Page 59.** Table 17. Row 1 should be labeled "Commercial Projects Sampled"
- **Page 71.** The results summary incorrectly summarizes the Market Transformation results. The 10% goal for housing starts is 2,542 not 2,094. Additionally, the actual starts value of 1,684 is 66% of the 10% projection. 66% results in an SSM of $132,484.
- **Page 73.** 2010 Residential Costs and Residential budgets include Small Commercial. This should be included in Business Markets. This change does not affect overall DSMVA calculation.
- **Page 80**. Refers to Appendix C. No Appendix C is attached.
- **Appendix A.** Due to the way costs are rolled up, incentives are not attributed by measure. It is advisable to remove or footnote this column of Table 30 to eliminate confusion. Similarly, it may not be appropriate to use "Savings per $1 of incentive payment" as a metric in Table 32.

The Power of Experience

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