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August 6, 2009

VIA COURIER

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

Re: Enbridge Gas Distribution Inc. ("Enbridge")
EB-2009-0154 2010 Natural Gas Demand Side Management (DSM) Plan

In accordance with the Ontario Energy Board's (the "Board") Procedural Order No. 1 dated July 22, 2009, enclosed please find the interrogatory responses of Enbridge.

This submission has been filed through the Board's Regulatory Electronic Submission System ("RESS"), two copies are being delivered by courier and it will be available on the Enbridge website at www.enbridge.com/ratecase as of Friday August 7, 2009.

If you have any questions, please contact the undersigned.

Yours truly,

Bonnie Jean Adams

Bonnie Jean Adams
Regulatory Coordinator

cc: EB-2009-0154 Interest Parties (via email)

I - INTERROGATORIES

1 – BOARD
STAFF

BOARD STAFF INTERROGATORY #1

INTERROGATORY

Ref: Exhibit B, Tab 1, Schedule 1, Pages 1-3

Enbridge Gas Distribution Inc. ("Enbridge") is seeking approval for its 2010 Demand Side Management ("DSM") plan.

(a) Please identify any deviations in Enbridge's 2010 DSM plan from the framework and budget escalators established for the 2007-2009 three-year DSM plan approved in DSM Generic decision EB-2006-0021.

If Enbridge has deviated from the approved framework decision, please comment on the specific nature of the deviations and provide the rationale for the decision to do so.

RESPONSE

Enbridge has submitted its 2010 DSM Plan in accordance with the framework approved in EB-2006-0021, with adjustments as noted below.

The requirements for targeted low income programs as part of the 2010 DSM Plan have been removed as per the Board's letter dated May 13, 2009 (EB-2008-0346). As per the Board's letter, targeted low income programs will be addressed separately from this proceeding.

A supplementary pilot program targeted at industrial customers was included as part of the 2010 DSM Plan. This initiative was developed through a recent market assessment which includes direct customer input and feedback. The details of this initiative are included in Exhibit B, Tab 4, Schedule 1. This pilot has the ability to inform future decisions for the next multiyear plan. Given the recent recessionary impacts on this customer segment, this initiative is even more important. The budget for this initiative is incremental to the formula outlined in EB-2006-0021. Enbridge requests that funding be approved for this important initiative.

Witnesses: M. Brophy
P. Squires

2 - BOMA

BOMA INTERROGATORY #1

INTERROGATORY

Ref: Exhibit B, Tab 1, Schedule 4, paragraph 11

EGD intends to focus on the Drain Water Heat Recovery ("DWHR") in its market transformation program.

a) Please indicate if DWHR units were available at retail outlets in 2009. If so, please indicate where such units could be purchased.

b) Are DWHR units currently available at retail stores? If yes, please provide a list of major retailers that carry such units.

RESPONSE

Please note that this program is targeted at new construction.

a) In 2009, DWHR units are available for purchase from the following retail outlets: Home Depot, Rona, and Sears.

b) DWHR units are currently available at the retail stores listed above.

Witnesses: M. Brophy
P. Squires

BOMA INTERROGATORY #2

INTERROGATORY

Ref: Exhibit B, Tab 1, Schedule 4, paragraph 13

a) Please provide the corresponding Scorecard Summary being used for 2009.

b) For each of the four Ultimate Outcomes metrics shown in the Scorecard Summary, please provide the most recent figures for 2009 and the current projection for each to be used in the 2009 Scorecard.

c) For each of the three Program Performance metrics shown in the Scorecard Summary, please provide the most recent figures for 2009 and the current projection for each to be used in the 2009 Scorecard.

RESPONSE

a) The Scorecard Summary for 2009 for the Drainwater Heat Recover program was filed with the Board on March 30, 2009:

Drainwater Heat Recovery		**2009 Metric Value Levels**			
Element	**Metrics (weighting)**	**50%**	**100%**	**150%**	**Weight**
ULTIMATE OUTCOMES	a) Builders Enrolled	6	12	16	/10
	b) Units Installed	325	650	975	/40
	c) Builder Knowledge	40%	50%	60%	/15
	d) Service Provider Promotion	60%	70%	80%	/20
PROGRAM PERFORMANCE	e) Builder Training Workshops	1	3	5	/5
	f) Contractor/Sub Workshops	1	3	5	/5

Witnesses: M. Brophy
P. Squires

b) Enbridge's 2009 program has not launched as of yet. Our current projection is to achieve the 100% performance level on each metric, but at this stage that will be a stretch.

c) Enbridge's 2009 program has not launched as of yet. Our current projection is to achieve the 100% performance level on each metric, but at this stage that will be a stretch.

Please note that for 2010, values will be prorated between the metric value levels and extrapolated for values that are outside the levels illustrated in the tables shown in the evidence (e.g. above those shown in the table).

BOMA INTERROGATORY #3

INTERROGATORY

Ref: Exhibit B, Tab 1, Schedule 4, paragraphs 4 -10

a) Please provide the historical results for 2007 and 2008 in the Scoreboard Summary format as shown in paragraph 10.
b) Please provide the forecasted results for 2009 (based on actuals to date and expected results over the remainder of 2009) in the Scoreboard Summary format a shown in paragraph 10.

RESPONSE

a) Historical results for 2007 and 2008 are as follows:

Home Performance Contractor		2007 Actual Results			
Element	Metrics (weighting)				Weight
ULTIMATE OUTCOMES	a) Average Increase in frequency scores of all weatherization measures	0.67			/60
MARKET EFFECTS	b) Contractor Engagement	68			/20
PROGRAM PERFORMANCE	c) Contractor Training Workshops	8			/20

Home Performance Contractor		2008 Actual Results			
Element	Metrics (weighting)				Weight
ULTIMATE OUTCOMES	a) Average Increase in frequency scores of all weatherization measures	0.37			/60
MARKET EFFECTS	b) Contractor Engagement	242			/20
PROGRAM PERFORMANCE	c) Contractor Training Workshops	15			/20

Witnesses: M. Brophy
P. Squires

b) Forecasted results for 2009 in the Home Performance Contractor program are as follows:

Home Performance Contractor		2009 Forecasted Results			
Element	Metrics (weighting)				Weight
ULTIMATE OUTCOMES	a) Average Increase in frequency scores of all weatherization measures	Year-end measure. No information available.			/60
MARKET EFFECTS	b) Contractor Engagement	YTD actual: 50 participants Year-end forecast: 70 participants			/20
PROGRAM PERFORMANCE	c) Contractor Training Workshops	YTD actual: 3 workshops Year-end forecast: 7-8 workshops			/20

Witnesses: M. Brophy
P. Squires

BOMA INTERROGATORY #4

INTERROGATORY

Ref: Exhibit B, Tab 4, Schedule 1

a) How will EGD recover the $1.25 million budget proposed for 2010 pilot program proposal?

b) From which rate class/classes will these costs be recovered?

RESPONSE

a) Enbridge will recover the $1.25 million budget proposed for the 2010 pilot program from rates as a component of the Company DSM program.

b) The costs will be recovered as indicated in the table below.

Gas Rate	Industrial Sector Pilot Program
1	0%
6	0%
100	0%
110	18%
115	36%
135	2%
145	5%
170	39%
Grand Total	100%

Applicable customers in these rate classes will have access to the pilot program.

Witnesses: M. Brophy
P. Squries

BOMA INTERROGATORY #5

INTERROGATORY

Ref: Exhibit B, Tab 1, Schedule 1

a) Please provide the DSM budget for 2007, 2008 and 2009, with and without Low Income.

b) Please provide the actual level of DSM expenditures for 2007 and 2008 and the most recent projection for 2009.

c) Please provide the actual TRC values for 2007 and 2008, both with and without Low Income. Please also indicate if the values for both years are audited actuals.

d) Please show the calculation of the estimated 2010 TRC target utilizing actual audited values for 2007 and 2008 (or best estimates) and the most current estimate of 2009 results. Please provide the calculation with and without Low Income.

RESPONSE

a) Please see table below.

	2007	2008	2009
DSM Budget	$ 22,000,000	$ 23,100,000	$ 24,255,000
Low Income Budget (including Market Transfomation)	$ 1,439,997	$ 1,515,001	$ 1,587,600
DSM Budget without Low Income	$ 20,560,003	$ 21,584,999	$ 22,667,400

b) Please see table below.

	2007	2008	2009
DSM Spending	$ 21,383,865	$ 23,026,660	$ 24,255,000

c) Please see table below.

	2007 Audited	2008 Audited
DSM TRC	$ 199,798,420	$ 182,706,679
Low Income	$ 5,222,829	$ 1,184,153
DSM TRC without Low Income	$ 194,575,591	$ 181,522,526

Witnesses: M. Brophy
P. Squires

d) Enbridge is not able to calculate a TRC target for 2010 until the 2009 DSM audit is complete. This is forecasted to occur in 2010.

3 - CCC

CCC INTERROGATORY #1

INTERROGATORY

Ref: Ex. B/T1/S1/p. 2

EGD has indicated that it requires additional funding to deliver a pilot program beyond that prescribed by the formula. Please explain why the pilot cannot be facilitated within the prescribed budget? Please confirm that the costs of the pilot will be allocated to industrial customers.

RESPONSE

Please refer to IGUA Interrogatory #11 at Exhibit I, Tab 6, Schedule 11 and BOMA Interrogatory #4 at Exhibit I, Tab 2, Schedule 4.

Witnesses: M. Brophy
P. Squires

CCC INTERROGATORY #2

INTERROGATORY

Ref: Ex. B/T1/S3/p. 3

Please specifically identify how EGD plans to collaborate with Union Gas in 2010 regarding evaluation.

RESPONSE

Enbridge and Union Gas have had a good history of collaboration where appropriate. Enbridge intends to continue to assess opportunities for continued collaboration in 2010. Opportunities will be assessed once advice on 2010 priorities is provided to Enbridge by the 2010 EAC.

Witnesses: M. Brophy
P.Squires

CCC INTERROGATORY #3

INTERROGATORY

Ref: Ex. B/T1/S4

With respect to the Home Performance Contractors Market Transformation Program please provide the following:

1. A detailed explanation as to how the program has been delivered in each year 2007-2009;
2. The results of the program in 2007, 2008 and 2009;
3. All comments provided by the EGD Auditor in each of those years regarding the program;
4. An explanation as to how EGD determined that it should receive an SSM pay-out for an $80,000 program of $150,000;

RESPONSE

1. The Home Performance Contractors MT program, approved by the Board in EB-2006-0021, is designed to increase the awareness and implementation of residential weatherization measures by renovation contractors. Each year the program is marketed, including material outlining the benefits of attending the Home Performance Contractors workshops and providing an explanation of what is covered during the workshop. This material is distributed and supported through the Ontario Home Builder Associations as well as the local home builder associations. Enbridge Channel Consultants also promote this initiative through their involvement with the renovation market. When sufficient interest has been registered for workshop attendance, a workshop is scheduled. A third party specialist in air sealing and home performance facilitates or delivers the workshops as required.

2. Program results for 2007 and 2008 are presented on the next page. In 2009, year-to-date, three workshops have been held with a total of 50 participants.

Witnesses: M. Brophy
P. Squires

Program Metrics	2007 Actuals	2008 Actuals
Contractor Training Workshops	8	15
Increase in frequency of at least 3 weatherization measures	0.67	0.37
Contractor engagement	68	242

3. Please find attached a copy of the 2007 and 2008 audit reports.

4. A Market Transformation approach is used where program impacts have a effects that are more robust than a typical resource acquisition program. It is commonly accepted by DSM professionals that Market Transformation programs can have greater overall benefits to society than a resource acquisition program, although these benefits can be often underestimated due to the difficulty related to measurement. The SSM amount of $150,000 was determined in consideration of the benefits of this program, the effort required by Enbridge, and the overall SSM envelope defined in EB-2006-0021. This value is consistent with results achieved based on the formula approved by the Board in EB-2006-0021.

Witnesses: M. Brophy
P. Squires

Audit Report on Enbridge Gas Distribution 2007 DSM Evaluation

A Report to the Audit Subcommittee of the DSM Consultative

Final Report

June 24, 2008

ECONorthwest
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Acknowledgements

This report was prepared by ECONorthwest's Portland office for Enbridge Gas Distribution and the Audit Subcommittee of the DSM Consultative. Dr. Stephen Grover was the ECONorthwest project manager for this analysis and was the primary author of this report. Questions regarding the report should be directed to him at grover@portland.econw.com or by phoning the Portland office at (503) 222-6060. Logan Van Ert at ECONorthwest assisted with this analysis. Mike Kennedy also provided a review of the prescriptive schools savings research.

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1. INTRODUCTION

ECONorthwest was asked by Enbridge Gas Distribution (Enbridge) in consultation with the DSM Audit Subcommittee to conduct an audit of the Enbridge 2007 DSM Annual Report. The structure of this audit is different than those that ECONorthwest has conducted for Enbridge in prior years in that there was no detailed review of project files by the auditor for a sample of custom projects. A review of project files was conducted by third party engineering firms as part of Enbridge's 2007 DSM evaluation. Consequently, the audit was limited to a more general review of the 2007 savings estimates and reviewing the supporting research provided by Enbridge for these programs. Throughout this process, Enbridge was very responsive and provided us with all the requested background materials in a timely manner.

The tasks done as part of the 2007 audit include the following:

- Confirmed that the TRC calculations utilized the agreed upon values for free ridership and per unit savings.
- Replicated the savings and TRC amounts reported in the SSM.
- Reviewed the DSMVA calculations
- Reviewed the LRAM calculations
- Reviewed two 3rd party engineering reports that evaluated the savings estimates for a sample of custom commercial, industrial, and agricultural projects.
- Interviewed the firms that conducted the engineering reviews.
- Reviewed a Summit Blue report researching residential free ridership rates (for showerheads, aerators, programmable thermostats, and furnaces)
- Reviewed a Summit Blue report researching deemed savings values for showerheads, thermostats, and aerators.
- Reviewed Enbridge study on combustion efficiency for boilers
- Reviewed Enbridge studies on 2007 market transformation activities
- Assessed the underlying assumptions used in savings estimates
- Reviewed program database and participation tracking systems
- Reviewed Enbridge studies used to determine installation rates for TAPS and Novitherm measures
- Reviewed two reports by Agviro that develop prescriptive savings values for boilers installed in secondary and elementary schools
- Reviewed status of recommendations from previous audits

- Reviewed specific issues as raised by the Audit Subcommittee;

Our review focused on the 2007 program areas as defined in the 2007 Annual Report:

- Residential Sector
  - Residential Water Conservation (TAPS Partners)
  - Equipment Replacement
  - Residential Retrofit – EnerGuide for Houses
  - ENERGY STAR Appliances – Front Load Washers
  - New Home Construction
  - Low Income
- Business Sector Results
  - Commercial Sector Results
  - Multi-Residential
  - Large New Construction
  - Industrial
- Market Transformation

The level of savings and TRC benefits associated with the residential and business sector resource acquisition programs as reported by Enbridge in the 2007 Annual Report is shown in Table 1. (This table is consistent with Table 2.1 in the 2007 Annual Report).

Table 1: 2007 Program Savings and Net Benefits (TRC) From Enbridge's 2007 Annual Report

Program Area	Participants	Gas Savings (m^3)	Net TRC Results
Existing Homes	320,092	26,887,911	77,140,669
Residential New Construction	1,091	782,905	773,155
Low Income	20,567	1,966,539	6,017,008
Small Commercial	641	1,067,062	2,115,524
Commercial	141	9,727,542	21,970,227
Multi-Residential	28,430	23,188,272	43,572,419
Large New Construction	56	2,433,345	6,386,572
Industrial	147	28,201,217	56,525,515
Overhead Costs			(5,282,987)
Total All Programs	**371,165**	**94,254,794**	**209,218,102**

2. REVIEW OF SSM CALCULATIONS

As part of the 2007 audit, ECONorthwest replicated the SSM calculations as shown in the 2007 Annual Report. This was done by obtaining an Excel file from Enbridge that contained all the savings and TRC calculations. The calculations shown in the report were actually done within Enbridge's program tracking database DARTS. At the beginning of the audit, we also met with Enbridge staff and walked through the DARTS data system. We also talked to Enbridge staff to gain an understanding of how participation, savings, and cost data are entered and tracked in the DARTS system.

The SSM calculations were obtained from Enbridge and then replicated and checked for the following:

- Accuracy with the final savings totals shown in the Annual Report
- Consistency with the agreed upon assumptions for calculation parameters (e.g., free ridership, per unit savings, savings adjustments)

Based on our review, we recommend the following adjustments be made to the 2007 SSM claim:

- Adjust the Novitherm free ridership rate from 1 percent to zero (the value approved by OEB).
- Adjust the low income TAPS installations using the same installation adjustment factors used for the other residential programs

- Reduce the Novitherm installation adjustment from 85 percent to 76 percent based on the actual installation rate estimated from the Enbridge's Novitherm installation survey.

- Reduce the total custom commercial gas savings values by 2.3 percent based on the findings from the engineering review.

- Reduce the total custom industrial gas savings values by 3.6 percent based on the findings from the engineering review.

- Use the prescriptive schools boiler savings values from the Agviro reports for 2007 only for those sites that are considered to be part of the prescriptive schools program.

- Reduce the SSM incentive amounts for the market transformation programs to $178,151.

Based on these adjustments, the audit recommended savings values for SSM are 92,719,087 m^3, which represents a decrease of 2 percent from the 94,254,794 m^3 SSM savings volume published in the 2007 Annual Report. Similarly, the recommended savings volumes result in a TRC value of 204,461,613, which is a decrease of 2 percent from the TRC value of $209,218,102 published in the 2007 Annual Report. The recommended TRC value results in an SSM claim payout of $8,380,774.

Additional detail on these recommended changes is provided below.

3. Review of DSMVA Calculations

As part of this audit, we reviewed the calculations used to determine the Demand Side Management Variance Account (DSMVA) adjustment. This involved reviewing the values input by Enbridge into the SSM spreadsheet provided for the audit review. Our review did not involve any review of financial records beyond what was included in the SSM spreadsheet.

Based on our review, we accept the DSMVA numbers as reported in the 2007 Annual Report.

4. Review of LRAM Calculations

The sample LRAM calculation provided by Enbridge was reviewed in this audit and was found to be calculated correctly using the same gas savings values utilized in the 2007 SSM calculation provided in the 2007 Annual Report. Additional adjustments to the SSM and/or LRAM calculations will likely be done later based on resolution of policy issues with the EAC or negotiations with interveners.

In addition to the SSM recommendations above, we recommend the following additional adjustments for the LRAM calculation:

- Revise savings values for showerheads (per our discussion of the Summit Blue analysis below)

- Adopt Summit Blue savings values for programmable thermostats and aerators

- Use a gross savings estimate of 28.3 therms for multi-family clothes washer replacements. This assumes a new, standard efficiency clothes washer as the baseline rather than the existing machine.

When these adjustments are taken into account, the gas savings values for LRAM recommended by the audit are 84,100,032 m^3. This represents a decrease of 11 percent from the 94,254,794 m^3 SSM volume published in the 2007 Annual Report.

The following sections present audit findings as they relate to the residential and business sector programs. In most cases, the savings estimates were consistent with the methods and values set for the 2007 programs as part of the Settlement Proposal. We have provided suggestions for evaluation research to improve the savings estimates for future years. These recommendations are all presented in the final section of this audit report.

5. RESIDENTIAL PROGRAM AUDIT RESULTS

For the Residential programs, we reviewed the savings calculations as well as some of major assumptions and evaluation research that is used in developing the savings estimates. The programs reviewed included:

- TAPS Partners
- Existing Homes (Water Conservation, Equipment Replacement, Thermal Envelope)
- Residential New Construction
- Low Income

The audit process also involved investigating specific issues raised by the Audit Subcommittee.

We also reviewed two evaluation reports completed by Summit Blue Canada that address free ridership and savings values for selected measures:

- *Residential Measure Free Ridership and Inside Spillover Study* (June 4, 2008)
- *Resource Savings Values in Selected Residential DSM Prescriptive Programs* (June 4, 2008)

The audit findings for each of these issues are discussed below.

5.1 SUMMIT BLUE FREE RIDERSHIP STUDY

As part of the audit process, we reviewed a residential free ridership and inside spillover study completed by Summit Blue. This study surveyed a sample of participants that adopted aerators, furnaces, low-flow showerheads, or a programmable thermostat through either an Enbridge or Union Gas DSM program. For furnaces, a survey of furnace installation contractors was also completed.

We have significant concerns about the methodology employed in the free ridership study. While the self-report survey questions are commonly used to estimate free ridership and spillover rates, they are notoriously sensitive to how questions are worded and the algorithm used to score responses. How "don't know" or "refused/missing" responses are weighted, for example, can dramatically change the overall free ridership or spillover estimate.

Specific issues include the following:

- Because the scoring method is multiplicative (scores from different questions are multiplied or averaged together to estimate free ridership), the mere process of adding questions to the battery will tend to change the free ridership estimates, especially if the scores are multiplied together. It appears that for the most part scores are averaged rather than multiplied, which should lessen this effect.

- The question scoring algorithm is very elaborate and the report would benefit from including a table (or series of tables) to show how responses from sample questions would be used to calculate the free ridership rate. The weights chosen to score responses appear to be arbitrarily determined.

- In addition to the survey responses, some of the scores are adjusted through a comparison with an upper and lower "influence bound". The weighting used to adjust the free ridership estimates relative to these bounds also seems to be arbitrary.

- Some free ridership estimates are adjusted using the results from a contractor survey. The contractor perspective will be a very noisy measure of customer intentions as they may not have interacted enough with the customer to assess what type of equipment they may have been considering or the timing of when the equipment was selected.

- The inside spillover results do not appear to remove any additional high efficiency installations that were rebated by a DSM program. Without removing these rebated installations, inside spillover will be overstated.[1]

- Some questions are not worded properly to get at the free ridership issues. In particular, the question on prior participation reads "How important was your experience with those energy efficiency programs in the past?" It does not specifically ask how important the prior participation was on selecting the measure currently being explored in the survey.

- For some questions, "don't know" or similar uncertain responses are weighted using a value of 0.5, while in other questions the same responses are weighted using a value of 0.25 or 0.

[1] As part of the Enbridge 2002 DSM Audit, ECONorthwest made a similar comment regarding participant spillover calculations done by Summit Blue in their earlier study for commercial projects.

- Only a very high level of discussion of the furnace market analysis is presented in this report, yet these results determine 50 percent of the free ridership calculation.

For these reasons, we do not recommend that the free ridership rates from the Summit Blue study be used for the 2007 (or future) programs. Until a different free ridership estimate can be completed, we recommend that the previous free ridership values be used for these measures.

5.2 Summit Blue Study on Savings Values for Residential Prescriptive Programs

The second Summit Blue study addressed the per unit savings values for aerators, low-flow showerheads, and programmable thermostats. For each of these measures, adjusted savings values have been developed based on a review of related research and impact studies conducted in other areas.

In general, this study appears to do a thorough job in exploring the related literature and developing savings estimates. Given time limitations, the audit did not attempt to review the sources used by Summit Blue or conduct an additional literature review to determine if other sources may be relevant.

In our review on the savings estimates for low flow showerheads, there were adjustments presented based on changes in water temperature and "throttling" where users increase the volume of water during a typical shower to make up for a lower flow. There was not much supporting evidence for these adjustments. We recommend that these adjustments be omitted from the impact estimates for showerheads.

Given the widespread promotion of low-flow showerheads in these programs, we recommend that Enbridge and Union work together to conduct their own study to estimate showerhead savings by metering customers in their service territories before and after the low flow showerhead installation. Given the volume of savings claimed for the showerheads each year, we recommend that conducting this study be a high priority. Until that time, we recommend that the savings values from the Summit Blue study be used without the changes suggested for temperature change and throttling.

Table 2 shows the savings values for low-flow showerheads (corresponding to Table 3-9 in the Summit Blue report). The highlighted column shows the savings values by ECONorthwest that do not include adjustments for throttling and water temperature.

Table 2: Adjustments to Low-Flow Showerhead Savings Estimates From Summit Blue Report

(Shaded Areas Are The Audit Recommended Values)

Sector	Gallons per Minute (Existing)	Gallons per Minute (Replaced)	Gas Savings: No Throttling (m^3)	Gas Savings: No Throttling or Temp Change (m^3)
Per Household	2.0	1.25	47	51
	2.1 – 2.5	1.25	74	78
	2.6+	1.25	114	117
	2.0	1.50	29	33
	2.1 - 2.5	1.50	59	60
	2.6+	1.50	95	100
Per Showerhead		2.00	11	16
		1.50	45	49
		1.25	65	67

There appears to have been less secondary research available for use by Summit Blue to develop savings estimates for programmable thermostats and aerators. As with showerheads, we recommend that the Summit Blue estimates be adopted for these measures until a study can be conducted by Enbridge to develop savings estimates that are tailored to its own customers.

5.3 New Home Construction

The Enbridge New Home Construction program currently pays builders a $100 incentive for each EnerGuide home and $100 for each ENERGY STAR home. There is no supporting evaluation research indicating that the $100 incentive is having any affect on the decision to build a new home to either the EnerGuide or ENERGY STAR standard. Given the small rebate relative to overall home building costs and the incremental costs associated with meeting the higher standard, it seems unlikely that this program is having any significant effect on the new construction market. We recommend that Enbridge conduct some evaluation research in this area to demonstrate the effectiveness of this program for future years.

5.4 Novitherm Panels

The Enbridge report on Novitherm panel installation is used to derive an 85 percent installation adjustment factor for the 2007 Annual Report. However, 9 percent of this reflects respondents that had not yet installed the Novitherm panel but planned to do so in within the next six months. Since the follow-up survey was done several months after the customer received the Novitherm panels, it seems unlikely that these panels will ever be installed. Even though the intended installer adjustment was already discounted by a factor of 50 percent by Enbridge (from 18 percent to 9 percent), we do not recommend that any of these intended installations be counted in

the 2007 SSM calculations. We recommend that the installation adjustment factor be reduced from 85 percent to 76 percent for Novitherm panels for the 2007 SSM and that only actual installations be counted in this adjustment factor in future years.

5.5 Other Residential Issues Raised by the Audit Subcommittee

Additional issues raised by the Audit Subcommittee are listed below, along with the information obtained during the audit addressing these issues.

Programmable thermostats – were customers with existing programmable thermostats screened out?

Enbridge indicated that the following steps are taken in their programs to screen out customers that had existing programmable thermostats replaced:

1. All applicants are considered eligible for the rebate
2. All applications are entered into the tracking system
3. Applications are screened to eliminate those that have already participated in the program
4. Customer are separated into 2 groups: those replacing programmable thermostats and those replacing manual thermostats
5. Only those applicants replacing a manual thermostat are forwarded to the DSM group for tracking savings.

TAPS adjustments due to non-installation – confirm that non-installation adjustment is applied to savings and not to participants or costs

We examined this calculation and confirmed that the adjustment is done to savings and participants in the SSM spreadsheet. The adjustment is not made for incentives, which have been appropriately reallocated to program direct costs for inclusion in the TRC calculation.

EnerGuide for Houses– Confirm that only 50 percent of benefits are claimed by Enbridge

We examined the per home savings values in the SSM calculations. The value used to calculate savings is 660.5 m^3, which is 50 percent of the 1,321 m^3 value approved in the Generic Hearing for the EnerGuide program.

New Home Construction – Confirm that, since the building codes changed in 2007, program participation in 2007 was restricted to those homes that were permitted in 2006 under the old code.

During the course of the audit, Enbridge checked on this issue with the program implementer EnerQuality. EnerQuality said that most builders rushed to get permits ready under the old code before the more stringent code was enacted in 2007. As a consequence, they assumed that the 2007 participants were all permitted under the old code and EnerQuality did not adjust their savings estimates to account for the new code. It does not appear that any evaluation work was

done to investigate this issue further by examining the actual building permits for homes that participated in 2007.

6. BUSINESS MARKET PROGRAM AUDIT RESULTS

The major business market program issues examined by the audit are described below, followed by a discussion of specific issues raised by the Audit Subcommittee on these programs.

6.1 REVIEW OF ENGINEERING STUDIES

As part of the audit, we reviewed two studies completed by engineering firms to review the savings estimates for custom projects in the industrial, commercial, and agricultural sectors. Our review was limited to reviewing the reports and discussing the results with the engineers who managed these projects.

The two reports reviewed were:

- Genivar report *Evaluation of 2007 Industrial Projects* (May 1, 2008)
- Building Innovations, Inc. report *Engineering Review of Enbridge Gas Distribution Custom Projects 2007* (March 2008)

It appears from the reports that the engineers generally had confidence in the savings estimates and recommend only small adjustments to the claimed savings (discussed below). In the case of the commercial custom projects, there were cases that projects were not very well documented and are noted in the report.

From an audit standpoint, there was little for us to review in these reports, as the description of the savings calculations for each project was generally limited to a page or less. Consequently, the audit was relying on the word of the reviewing engineer that the underlying calculations were sound and adequately documented. We were unable to review firsthand the underlying assumptions (beyond what is included in the engineering report) or see any of the supporting documentation due to time constraints for this audit. Consequently, the actual savings calculations were not reviewed as part of this audit.

For future audits, we recommend that the audit involve reviewing the background files for a sample of projects reviewed by the engineering firms. This would include reviewing any relevant background information on individual projects including engineering studies, audit documents, e-tool printouts, invoices, baseline consumption data, existing equipment efficiency data, operating hours, and documentation on the new equipment as installed. Due to time constraints, we were unable to conduct such a review as part of the 2007 DSM audit, although Enbridge expressed a willingness to cooperate with this effort.

In the engineering reports, each firm made some recommendations for future evaluation work and we agree with these recommendations. Recommendations from both engineering reports that are not already being discussed in this audit report are summarized below. Additional context for these recommendations is available in the engineering reports.

From the Genivar industrial and agricultural project engineering review:

- **Extend engineering review period**. Consider spreading the file review and site investigation process over a longer period. To arrange 13 site investigations and maintain credible notes for later review and reporting is problematic – particularly with other project commitments and weather (travel) issues to overcome in the time allotted.

- **Avoid double selection.** Enbridge may wish to consider a process to ensure that clients are not double interviewed for the engineering review and then some other evaluation or implementation task. This occurrence was noted by a few clients who expressed inconvenience to participate in two interviews.

- **Client preparation.** Enbridge may wish to provide a standard template of questions to be provided to the clients in advance of our site inspection so they may be better prepared.

- **Include additional documentation for project files.** Enbridge should require the following items in the project file. (Note that similar documentation recommendations have been made in past audits):

    - EGD files may consider addition of the following items to aid in the file review process;

    - Photos before and after measure.

    - "Cut sheets" of major new equipment – it is noted in some cases EGD files provide excerpts of reports and manufacturer's correspondence and /or quotations (which contain some technical information).

    - Commissioning reports by contractors and/or field-testing by EGD.

    - In some cases, the feasibility of the measure was prepared using a degree-day model to account for the variation in the year. EGD may wish to include a spreadsheet graph to track the natural gas consumption pre and post implementation of the measure versus degree-days.

From the Building Innovation commercial file review:

- **Benchmark data.** Enbridge should collect data on the number of suites and floor area of all buildings as part of their EEP application. These data will help to highlight problem areas, improve savings estimates, and identify problems with utility balances and assumptions about base case seasonal efficiency.

- **Seasonal Efficiency.** The seasonal efficiency of a boiler will vary from close to combustion efficiency during peak load condition, to a worst-case value during low load conditions. The E-tools calculation for seasonal efficiency should be based on a Bin model approach to account for these differences. In addition, it is recommend

that Enbridge complete a study of the combustion efficiency of newly installed boilers to account for possible differences in laboratory published efficiency numbers and the actual efficiency achieved by the installed boilers.

- **Heating Distribution System.** The E-tools should take into account the nature of the heating distribution system when evaluating their savings. Savings are claimed based on control of the heating loop temperature without regard for the nature of the heating loop. The following are some factors that will impact the effectiveness of a heating loop temperature reset strategy:
  - Zone controls
  - Nature of zone controls (separate thermostat, unit mounted thermostat, valve)
  - Condition of zone controls
  - Age of building
  - Thermal resistance (R value) of walls and windows
  - Evidence of windows being opened during heating season
  - Degree of reset possible
  - Controls have selective or representative zone temperature feedback
  - In cases where a building has new zone controls, the impact of loop temperature rest, load compensation, and zone feedback will be an order of magnitude lower than an older building with no zone controls and evidence of suite overheating. The gas savings resulting from prescribed measures such as reflective heating panels will also be impacted by these factors.
- **District Steam.** EnWave produces district steam to customers in the downtown core of Toronto and claimed gas savings based on a reduction in steam use for certain projects. This leads to the possibility of double counting if EnWave offers similar incentive programs. In addition, assumptions regarding conversion and transmission efficiency of the EnWave boilers should be consistent across projects. Factors to be considered in setting this conversion factor include the existence of co-generation, or reuse of waste heat in the steam generation process, which could impact savings.
- **Reflective Heating Panels.** The gas savings resulting from the installation of reflective heating panels is dependent on the following factors:
  - The area of reflective panels installed on outside walls.
  - The indoor wall temperature, which should vary according to distribution water temperature, and local controls.

- The thermal resistance (R value) of the wall construction
- Average outdoor air temperature in the heating season.
- It is recommended to create prescribed gas savings per square foot of installed panel (on outside walls only) to improve accuracy with only a modest increase in complexity.

- **Ventilation Scheduling.** Many multi-unit residential buildings rely on outdoor air being supplied to the corridors and then transferred into the suites for indoor air quality purposes. The practice of scheduling make up air units, or reducing fan speed during certain periods, to achieve energy savings may be in violation of local building codes and bylaws, although there is a variation of opinion in the industry regarding these requirements. The mater is further complicated by legal "grandfathering" issues, changes to air quality standards, and delays in local adoption of such standards. To address these issues, it is recommended that Enbridge obtain a professional opinion on the practice of reducing ventilation in occupied residential buildings, and use these recommendations to form business rules around savings based on these practices. In projects where a professional engineer is involved in the project, it is recommended that Enbridge obtain a written statement from the local authorities or engineer confirming code compliance.

6.2 PROJECT SAMPLING

The sampling method used for the custom projects is consistent with the method agreed on for the 2007 program year. However, the current sampling method does not result in adequate coverage of projects with electricity and water savings. Of the 13 industrial and agricultural projects sampled, only 3 had electricity savings and none had water savings. For the 17 commercial custom projects sampled, only 5 had electricity savings and none had water savings.

In addition to expanding the sample (or drawing a separate sample to cover electricity and water savings), we also recommend that the sample be expanded to cover a representative sample for large measure groups and end uses within each business market. For example, a sample should be drawn to achieve a 90/10 relative precision for large measure/end use categories such as steam traps, boilers, process adjustments, heat recovery within both the commercial and industrial sectors. This would allow the results from the sample review to be applied more accurately to the measure groups being reviewed (e.g., apply the sample steam trap results to all of the steam trap measures for that program year within that sector).

The purpose of drawing a representative sample of projects is to allow for sample results to be applied to the entire population. Consequently, we recommend that the results of the engineering review be applied to all of the projects within that sector for gas savings.

As discussed, there were only a handful of projects with electrical savings reviewed by third party engineers and no projects were reviewed with water savings. Given the very small sample sizes, we do not recommend adjusting the electricity and water savings claims. We recommend that these samples be increased in future years so that the kWh and water savings estimates can receive an adequate review.

6.3 PRESCRIPTIVE SAVINGS VALUES FOR SCHOOLS

As part of the 2007 Audit, two studies were reviewed that relate to boiler installations in schools:

- *Elementary Schools Prescriptive Savings Analysis* (Final Report, November 23, 2007)
- *Secondary Schools Prescriptive Savings Analysis* (Final Report, November 23, 2007)

These studies were completed by the engineering firm Agviro and are designed to provide a single prescriptive savings value for boilers replaced in schools. The audit team reviewed this report but did not review any of the background calculations or data were reviewed as part of this audit.

The prescriptive schools program began with a few projects in 2007, although it was not formally supposed to begin until 2008. For this audit, we reviewed the savings study to determine if the savings values should be used for the 2007 prescriptive projects and to provide suggestions for using the savings values in future program years.

In general, it appears that the Agviro report is a sound study and we recommend that the study values be used for gross savings for the prescriptive schools projects in 2007, as the study currently represents the best available information for a prescriptive savings values.

Moving forward, there should be more information provided on how the baseline boiler condition is calculated. The Agviro study relies on Enbridge boiler E-tool but there is no background information provided that supports the underlying assumptions for the baseline. The base case needs to reflect a typical boiler installation and should be supported with some documentation. A couple of parameters appear to assume overly optimistic values that result in a higher savings estimates:

- **Flue Damping.** Flue damping is set to "none" in the base case calculations. While there are certainly cases of this, there are also forced draft burners available and installed in these boilers. Some sort of base case saturation should be established and the base case assumption regarding flue damping needs to be the weighted average of these two cases.
- **Modulation.** Currently the base case assumes no modulation. Modulation would be required in this boiler in most US energy codes and it is unlikely the base case is always non-modulating in Canada. This is particularly true in the larger boiler used in the secondary schools analysis.
- **School size restrictions.** For the secondary schools analysis, only schools with consumption of 100,000 m3 or more were used in the analysis. For elementary schools, only schools with less than 100,000 m^3 were used. The elementary school sample was reduced further by eliminating all small schools with consumption less than 30,000 m^3. It is unclear why any of these restrictions were made and omitting the smaller schools will tend to inflate the savings values. Given that this study is designed to create a single prescriptive savings number that will be applied to

schools of all sizes, the smaller schools should not have been excluded from either sample. Omitting the small schools will also tend to inflate the savings estimate if these schools typically have smaller than average boilers.

We recommend that additional support for these assumptions be provided if these savings values are to be used in future years. This includes supporting background information for the base case for the nine input parameters used in the Enbridge boiler e-tool. Depending on how well these assumptions are documented, the recommended savings value may change for future program years. We also recommend that the savings values be recalculated using the small schools in the sample.

6.4 Other Business Market Issues Raised by the Audit Subcommittee

Multi-residential showerheads and aerators – review validity and support provided for installation rates.

This issue was raised with Enbridge as part of the audit. Enbridge reports that they are unable to survey the multi-family residents about these installations due to privacy legislation. They are looking for other alternatives for conducting these verifications. Consequently, the installation rates assumed for these measures have not been verified, beyond relying on what the contractors are reporting as installed.

We recommend that Enbridge work with the program implementers to obtain waivers from the customers that receive showerheads and aerators so that some form of verification can occur, either by phone or through an on-site inspection.

If a study for the multi-residential sector is not done in the next year, we recommend in the future that the non-installation adjustment factors from the single family TAPS survey be applied to multi-family for these measures.

Multi-residential Recommissioning – Review assumption regarding 5-year measure life

Enbridge models their program on a similar NRCan program, which uses the same 5-year measure life assumption for recommissioning. The measure life assumption for commissioning is currently being researched in the large California impact evaluations and there is very little research that has been conducted on this topic. Given the lack of research, we do not have any suggestions for improving the 5-year measure life assumption.

The Company's proposed Recommissioning program was approved in the Multi-year plan. However, the Company did not put forward any projects under this program in 2007 as the program is still in development. The Company is working with NRCan and other stakeholders to form a Canadian building commissioning association. Once formed, this new group will develop standards and/or guidelines for recommissioning. The Company will then bring forward any necessary changes to its program assumptions.

Multi-residential Washing Machines – Review assumptions on savings and free ridership and determine if these take into account the new minimum efficiency standards.

Enbridge provided the audit information on the parameters used to calculate savings and the audit confirmed that these savings parameters are the ones being used in the SSM savings calculations for these measures.

The savings are calculated relative to existing equipment, not the new minimum efficiency standard. Enbridge says that this is justified as the programming is targeting early replacements, but it is not clear how this is being accomplished. We recommend that savings be calculated relative to a new standard efficiency clothes washer rather than using the existing equipment efficiency.

In this audit, we completed a very limited online search for clothes washer savings values for multifamily buildings that assume a new, standard efficiency machine as the baseline. From this review, we found that the Energy Trust of Oregon uses a value of 28.3 therms for clothes washer replacements in multi-family buildings. We recommend that this savings value be used until Enbridge can develop a better estimate.

Large New Construction – examine the program and participant screening process and determine if it accounts for the 2007 code changes.

During the course of this audit, Enbridge found that the new code was implemented in April 2007 but that no changes were made in the program administration to reflect the higher standards. During the course of this audit, Enbridge has reviewed the individual large new commercial files and found one project that was likely built under the new 2007 code. The savings for this project have been revised and this change has been incorporated into the audit version of both the SSM and LRAM calculations.

7. MARKET TRANSFORMATION

We reviewed the market transformation projects and reports and it appears that Enbridge has attempted to examine the metrics established for these programs. However, we have concerns that the methods used may not be showing discernible progress on these metrics. As discussed below, we believe that progress on these metrics should be considered valid only when the increase in the metrics is statistically significant.

For future program years, we strongly suggest that new metrics be established for these programs. The first step in this process should be developing logic models and program theory for each market transformation program. The logic models will clearly show the links between program activities and outcomes, and how these outcomes translate into short-term, mid-term, and long-term market changes.

Once these links have been established, then appropriate metrics of market transformation can be established. These metrics need to reflect changes in the marketplace that can logically be traced back to program activities. For example, measuring increased contractor awareness of a program or construction practice that is promoted by a program or program-sponsored training session might be considered a valid indicator of market transformation, depending on the context. Some of the current indicators used for the 2007 are actually program activities and not measures of market change. These include:

- Number of training events held
- Number of training participants
- Number of trade show exhibits
- Number of technical guides and case studies developed

These program activities are not appropriate indicators for market transformation.

Below are comments about the specific market transformation metrics and recommended adjustments to the 2007 claims.

7.1 EnerGuide for Fireplaces

In 2007, Enbridge started an in-store program designed to increase awareness of the EnerGuide label for natural gas fireplaces through point of purchase communication material and sales associate training. Evaluation research was conducted to address the following metrics:

- Measure the change in awareness of the EnerGuide label for natural gas fireplaces following the in-store point-of-purchase campaign.
- Determine if the EnerGuide label had an influence on which natural gas fireplace was purchased.

This study correctly examines whether the differences in survey findings are statistically significant across survey waves. It also conducts the surveys 6 months apart, which is appropriate to determine if the program activities have made a lasting impression and therefore might be good indicators of market transformation. Based on the survey findings, no statistically significant differences in awareness were observed and consequently no SSM claim is being made for these metrics.

As discussed below, we recommend that a method similar to those used in this study be adopted for the other market transformation metrics. In particular, only statistically significant differences between survey waves should be considered as evidence for meeting a set market transformation performance goal. The survey waves should also be fielded an appropriate period apart in order to measure any lasting changes.

7.2 Home Contractor Performance

The Home Performance Contractor Market Program was designed to increase the frequency of weatherization measures (air sealing and insulation) included in home renovation and upgrade projects in the residential sector through industry-delivered workshops. During the first program phase, a series of eight workshops ran from March 27 to May 8, 2007. A self-administered survey was completed just before the course began and the results of this survey established baseline measurements.

Approximately six months later, participants were re-contacted and asked to complete the same questionnaire. The purpose was to determine the degree to which they had increased the

frequency of implementing weatherization measures, following the course. The metric examined is a shift of 1.0 on a 5.0 scale, where a 1.0 shift corresponds to 100 percent of the SSM incentive being paid. While there was an increase in survey responses for the metrics, given the sample sizes it is unlikely that this difference is statistically significant.

Although this metric was set for 2007, it is difficult to justify as it is unclear how a change in these numeric ratings translate into actual market progress. We do not recommend that SSM incentives be paid for this metric for 2007 based on the results of this study as the results are not significantly different across surveys. If this metric is going to be continued in future program years, we recommend that the average change in responses be calculated with a confidence interval and only a statistically significant increase in ratings be eligible for an SSM incentive.

7.3 BOILER MARKET TRANSFORMATION

A similar survey was used for the Boiler Market Transformation program to measure changes in knowledge for contractors and engineers. Progress on this metric was measured using a survey administered to 24 participants of the High Efficiency and Condensing Boiler workshop at the PM Exposition Conference held in Toronto on November 28-30, 2007. This survey was designed to measure the increase in awareness and knowledge at the end of the workshop compared to results taken at the beginning of the workshop. The follow up survey for these contractors was done immediately after the workshop was completed and compared with the same survey questions administered at the start of the workshop (approximately 1 hour earlier).

This is not an appropriate measure of market transformation. Fielding the follow-up survey immediately after the workshop is not a reliable indicator of how well the information is being retained. As discussed above, the attendees should be surveyed only after an appropriate period of time has passed to determine if any of the training is being retained and (ideally) that the information is actually being translated into sustained changes in market activity.

In addition to the problem of when the follow-up survey was administered, two of the questions appear to be unrelated to the metrics set for this program:

- Q1. According to research, what criterion is most commonly used by managers when deciding whether to spend capital funds on projects? (select one answer) (a) First cost, (b) Net present value (NPV) and internal rate of return (IRR), (c) Simple payback, (d) Discounted payback

- Q2. You could be leaving money on the table if you use one of the following methods when deciding to spend capital funds on projects: (select one answer) (a) Simple payback, (b) First cost, (c) Net present value (NPV), (d) Discounted payback

These two questions are not measuring any type of market change as they cannot be linked to any sort of practice or activity done by those taking the survey.

The fourth question in the survey is as follows:

- Q4. Select the applications that are best suited for condensing boilers: (select as many as apply) (a) Direct-fired domestic hot water, (b) Baseboard convectors, (c) Make-up air heating, (d) Pool heating, (e) Snow melting

In this case, multiple responses were allowed which diminishes the value of this question as a metric, as it is unclear if the correct response is provided first (as the primary responses) or as secondary response.

We do not believe that this survey has adequately demonstrated any progress on this metric in 2007. Consequently, we recommend that no SSM payments be made on the boiler market transformation component for 2007.

7.4 BUSINESS PARTNERS

The Business Partners study was designed to establish a baseline of awareness among HVAC contractors and engineers. The study was completed by Enbridge was designed to establish the number of HVAC designs/projects that have been undertaken in the past 12 months and determine the percentage of energy-saving technologies currently implemented.

As with the other studies, the change in the metrics should be calculated using a confidence interval. In this study, it also appears that the reported precision from the results is calculated incorrectly. The group of 242 contractors and engineers listed in the report is a sample of contractors, not the population, as there are presumably more contractors than this working in the Enbridge service territory. Assuming a population of 1,000, for example, then the precision level for the sample of 66 HVAC contractors falls to +/- 12% (at 95% confidence). With the same population, the precision for the sample of 52 engineers is +/-13% at a 95% confidence level.[2] With these larger confidence ranges, it does not appear that there are significant differences in this metric over time.

The final metric value is calculated as a weighted average among the frequency of responses for the following technologies:

- Natural gas fired Desiccant Dehumidification
- Natural gas fired Humidification
- Ceiling-mounted Destratification Fans
- Air Doors / Air Barriers / Air Curtains
- Demand Control Ventilation

It would also be useful to see how the survey responses changed for the individual technologies, rather than just the weighted average value. If the weighted average calculation is being skewed

[2] These confidence ranges do not vary much across different assumed population values once the population reaches a few hundred.

too much by one technology, it may be more appropriate to use a metric that is calculated for each technology separately.

Furthermore, since this study is being done to establish a baseline, it is unclear why it is being considered as a measure of market transformation. By definition, the baseline measure would not have anything to do with Enbridge's market transformation efforts. Consequently, we recommend that no SSM payments be made for this metric.

7.5 MARKET TRANSFORMATION ADJUSTMENT SUMMARY

Table 3 shows the recommended values to be used for the market transformation SSM payments based on the audit discussion above. Based on the suggested revisions, we recommend that the market transformation SSM payments be reduced from $434,601 to $178,151.[3]

[3] Note that the totals do not match the values in the 2007 DSM Report as Enbridge has subsequently reported additional progress on two metrics for the Boiler Market Transformation program.

Table 3: Market Transformation SSM Adjustments

Program	Metric	Enbridge 2007 SSM Claim	Recommended 2007 SSM Claim
EnerGuide for Fireplaces	# of stores with EnerGuide point-of-sale materials	$68,400	$68,400
Home Contractor Performance	# of contractors training workshops	$26,667	$26,667
Home Contractor Performance	Increase in frequency of weatherization measures implemented	$40,200	$0
Home Contractor Performance	# of workshop participants	$22,667	$22,667
Boiler Market Transformation	% increase in engineer and contractor awareness of high efficiency boilers	$206,250	$0
Boiler Market Transformation	Benefit/Cost Sales Tools	$25,000*	$25,000
Boiler Market Transformation	# training events held	$6,250*	$6,250
Boiler Market Transformation	# training participants	$16,667	$16,667
Boiler Market Transformation	# trade show exhibits	$12,500	$12,500
Business Partners	Baseline established	$10,000	$0
Total		**$434,601**	**$178,151**

*Payment value adjusted by Enbridge after completing the 2007 DSM report.

8. AUDIT RECOMMENDATIONS

We found that the 2007 Annual Report generally conformed to the methods agreed upon for these programs. As discussed above, we were unable to conduct a detailed review of the custom savings estimates due to the limited information available in the 3rd party engineering reports completed for the 2007 evaluation.

We recommend the following adjustments be applied to the 2007 DSM results:

- Adjust savings values for low income TAPS measures (showerheads, aerators, pipe wrap) based on the results of the TAPS installation survey
- Adjust custom project savings for gas based on the results of the engineering review studies.
- For market transformation, reduce the SSM claim to $178,151.
- Use the prescriptive schools boiler savings values from the Agviro reports for 2007 only for those sites that are considered to be part of the prescriptive schools program.

- Use a 76 percent installation adjustment factor (instead of 85 percent) for residential Novitherm panels.

We recommend that the following adjustments be made to future DSM claims (2008 onward):

- Adjust showerhead and thermostat per unit savings based on the Summit Blue studies using adjustment discussed in this audit report.

- Apply TAPS installation adjustments to multi-residential showerhead and aerator installations until a study can be conducted addressing the multi-family sector.

- Revise as needed the prescriptive school savings values based on new information on the base case conditions.

- For Novitherm panels, only use survey results for customers that have actually installed the panel to calculate the installation adjustment factor.

The following are recommendations for future evaluation research.

- **Conduct a new residential free ridership study with the survey questions and scoring methods thoroughly vetted prior to fielding the survey.** This will allow for a study to be completed that provides results that can be applied with confidence to the savings estimates. We also recommend a method that utilizes fewer questions with a less complicated weighting scheme. Having the survey questions and scoring method reviewed prior to fielding the survey will help ensure that the study produces results that can be used in the net savings calculations.

- **Develop savings values for showerheads using a sample of metered Enbridge customers.** Meter tests for showers. Enbridge should conduct a study on low-flow showerheads that involves metering a randomly selected sample of participants before and after the new showerhead is installed. The sample should be large enough and cover enough housing types (single family and multi-family at a minimum) so that the results can be extrapolated to the population.

- **Create formal logic models and program theory documents for the market transformation programs.** For the market transformation programs, it is important to develop program logic models and associated program theory to articulate what each program is attempting to achieve. These logic models will clearly show the program activities, the associated direct outputs, and how these outputs will result in short-term, mid-term, and long-term market outcomes. NYSERDA has done extensive work developing these models for their programs and these will serve as a good template for what is needed for the Enbridge market transformation programs.

  Progress on the various market transformation metrics should also be calculated using confidence ranges (i.e., 90 percent confidence level with an error of +/-10%). Incentives should only be paid on those metrics that show improvement that is statistically significant.

- **Use the logic models and program theory to develop performance metrics for market transformation programs**. Once the logic models and program theory have been developed, specific metrics should be developed that measure the various links between program activities, outputs, and outcomes. Progress on these metrics will then serve as the basis for all evaluation activities for these programs. As discussed previously, activities performed by the program should not be considered as metrics of market transformation (although these were the metrics set for the current programs).

- **Use larger samples for engineering review, covering the major equipment types and end uses.** Future engineering reviews should utilize larger project samples so that statistically representative samples for the major measures and end uses within sectors are represented. This will allow the sample results to be extrapolated to the population with a greater degree of confidence.

- **Create separate samples to cover projects with electricity and water savings.** A separate and larger sampling method and file review should be done for projects that involve electricity and water savings as these are savings amounts that can contribute to net benefits. The 2007 samples had only a few electricity projects and no water projects. Consequently, the savings calculations received very little review by the 3rd party engineers and no review by the auditor.

- **More project detail needed in the engineering review report.** For the projects reviewed by the 3rd party engineers, much more detail should be made available. This includes any engineering site or design reports, documentation of assumptions used to calculate savings, information on existing equipment, printouts from e tools, and any other information that is necessary for an auditor to see how savings are calculated.

- **Revise savings estimates for clothes washers for multi-family units.** We recommend that savings be estimated based on a comparison with a new, standard efficiency model rather than the current practice of comparing the high efficiency model with the existing equipment. A placeholder savings value was recommended for 2007 until research into a new value can be completed.

- **Conduct research on effectiveness of EnerGuide and ENERGY STAR new home construction rebates.** It seems unlikely that these rebates are having any affect on the new construction market. Research demonstrating the incremental benefits of these rebates on builder behavior should be conducted for future program years.

- **Adopt recommendations provided in the 3rd party engineering review studies.** Each of the engineering studies provided a list of recommendations for future evaluation work (summarized above). The audit supports each of the recommendations made by the engineers regarding future evaluation activities and encourage Enbridge to adopt them as soon as possible.

THE CADMUS GROUP, INC.

Report

Independent Audit of 2008 DSM Program Results

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Introduction and Overview

The Cadmus Group (Cadmus) was retained by Enbridge Gas Distribution (Enbridge), in consultation with the Enbridge Audit Committee (EAC), to conduct an audit of the Enbridge 2008 DSM Annual Report. Cadmus staff reviewed calculations and assumptions, background material and supporting documentation, and internal Enbridge processes and procedures.

Cadmus' Approach to the Scope of Work

Our approach to the scope of work addresses five concerns:

- Are the inputs to the savings financial calculations based on assumptions approved by the Ontario Energy Board (OEB)? Are they gathered and documented in a reliable manner? Are they consistent with the best available current information?
- Are market effects adequately tracked and attributable? Are baseline data collected and available?
- Are the economic and financial calculations accurate and based on agreed-upon rules, protocols, and procedures? If not, where are the differences and to what can the deviations be attributed?
- Are the SSM, DSMVA, and LRAM calculations accurate and consistent with methodology and assumptions approved by the OEB? If not, where are they different?
- Are savings, free-ridership, and measure life assumptions consistent with the best available current information?

Cadmus Approach to the Audit

The Cadmus approach to this audit involved the following general activities:

- Review of documents including memos, reports, filings and third-party assessments. (A list of documents reviewed is included in Appendix A.)
- Review and verification of EAC recommendations and Enbridge responses from the 2007 audit (included as Appendix B).
- In-person and telephone discussions with Enbridge staff.
- Meetings with Enbridge and EAC.
- "Live" Internet meetings and presentations of tracking databases and spreadsheet calculations.
- Detailed, in-person "walkthroughs" of program participation processes and quality assurances procedures.
- Follow-on telephone discussions with Enbridge staff, report, and with the authors of , reports, and other documents, as document authors, where necessary.

Key Meetings and Discussions

The Cadmus team met with Enbridge staff and the Evaluation and Audit Committee (EAC) on February 24 and 25, 2009, to review the scope of work, collect initial documents, and gain an overview of the Enbridge DSM programs, data collection methodologies and systems, and the audit function.

Subsequent to that meeting, Cadmus and Enbridge staff conducted weekly or bi-weekly status-update phone calls, and they communicated via e-mail on a regular basis. Cadmus submitted more than 30 requests for information and clarification to Enbridge during the course of the audit, and Enbridge was diligent in providing timely response to the requests. (A list of questions submitted and Enbridge's responses are included as Appendix B.)

Our review of Enbridge program processes, data tracking, and oversight activities identified several areas reflective of industry best practices, among which are:

- The development of a free-ridership methodology for commercial and industrial custom measures
- The development and continual improvement of the E-Tools custom project screening tool, and
- Program QA/QC procedures, especially with regards to third-party implementation of residential direct install programs

On March 3 and 4, 2009, Enbridge hosted discussions between Cadmus and the commercial and industrial engineering review firms BII and Genivar to discuss the draft custom project reviews.

On May 5, 2009, Cadmus staff again met with Enbridge staff and the EAC in Toronto to review the final work plan. Following that meeting, bi-weekly conference calls with Enbridge staff and the EAC were conducted to discuss audit issues as they arose during report preparation.

The Cadmus team reviewed all programs included in the Total Resource Cost (TRC) calculation. The review was tiered according to the total claimed savings by the program and any issues identified in past audits. We compared the prescriptive savings with weather-adjusted savings for like measures in other jurisdictions.

Based on this initial review, we identified the following programs and measures for more in-depth analysis:

- Showerheads
- Pre-rinse spray nozzles
- Custom engineering studies
- Prescriptive boiler savings

Findings and Opinion

For the calendar year ended December 31, 2008, Cadmus has audited the following:

- Demand-Side Management (DSM) Annual Report
- TRC (Total Resource Cost) savings
- Shared Savings Mechanism (SSM)
- Lost Revenue Adjustment Mechanism (LRAM)
- Demand Side Management Variance Account (DSMVA) of Enbridge Gas Distribution

The DSM Annual Report and the calculations of TRC, SSM, LRAM, and DSMVA are the responsibility of Enbridge's management. Our responsibility is to provide an opinion on these amounts, based on our audit.

We conducted our audit in accordance with the rules and principles set down by the OEB in its Decision with Reasons, dated August 6, 2006, in EB-2006-0021. We followed directions given to us by the Evaluation and Audit Committee of Enbridge Gas Distribution with respect to the scope, depth, and focus of our audit. The audit included examining evidence (on a test basis) that supported the amounts and disclosures in the DSM Annual Report as well as the calculations used to determine the numbers proposed for TRC, SSM, LRAM, and DSMVA. The audit also included assessing assumptions used and methods of recording and measuring information. 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 described there.

In our opinion, and subject to the qualifications set forth above, the following figures are calculated (1) using reasonable assumptions, based on data gathered and recorded via methods that are reasonable and accurate in all material respects, and (2) following rules and principles established by the OEB and applicable to the 2008 DSM programs of Enbridge Gas Distribution:

TRC Savings	$182,706,679
SSM Amount Recoverable (Resource Acquisition)	$5,607,522
SSM Amount Recoverable (Market Transformation)	$318,825
LRAM (Recoverable from Ratepayer)	$37,291
DSMVA Amount Recoverable	$(73,340)

Table 1, on the following page, lists the individual program changes reflected in the final SSM, LRAM, and DSMVA amounts. SSM savings were adjusted only by the incorporation of the agricultural realization rate into the overall commercial realization rate, as noted in the custom commercial and industrial program discussion below.

Table 1. Adjusted TRC and LRAM Savings

Program Area	Participants	Gas Savings (m3)	DSM Fixed and Variable Costs	Net TRC Results	Adjusted Net Gas Savings (for LRAM)	Adjusted Net TRC Results (for SSM)
Existing Homes	934,150	14,857,208	8,281,218	$43,113,761	14,279,514	$43,113,761
Residential New Construction	1,768	1,709,833	320,693	$498,507	1,709,833	$498,507
Low Income	17,317	584,712	996,085	$1,184,153	581,351	$1,184,153
Total Residential	**953,235**	**17,151,753**	**9,597,996**	**$44,796,421**	**16,570,698**	**$44,796,421**
Small Commercial	1,040	2,229,460	477,251	$4,346,038	852,849	$4,346,038
Large Commercial	219	15,390,429	1,688,426	$33,112,388	15,613,113	$33,559,011
Multi-Residential	23,737	17,654,343	2,181,397	$32,232,293	17,678,287	$32,771,114
Large New Construction	59	3,485,097	570,519	$11,654,781	3,529,074	$11,667,996
Industrial	140	23,871,775	2,197,990	$61,411,882	23,846,594	$61,350,871
Total Business Markets	**25,195**	**62,631,104**	**7,115,583**	**$142,757,382**	**61,519,917**	**$143,695,030**
Market Transformation Programs			528,311			
Program Development and Market Research			685,777	($685,777)		($685,777)
Overheads			5,098,995	($5,098,995)		($5,098,995)
Total All Programs	**978,430**	**79,782,857**	**23,026,662**	**$181,769,031**	**78,090,615**	**$182,706,679**

Table 2 lists the individual measure assumptions that were incorporated in the adjusted LRAM gas savings.

Table 2. LRAM Savings Adjustments

LRAM Savings Changes	2008 Draft Annual Report		Adjusted per Audit		Comment
Measure	Savings per Unit (m3)	Free-ridership	Savings per Unit (m3)	Free-ridership	
EXISTING RESIDENTIAL					
TAPS Partners Program - Kitchen Aerators	22	31%	23	31%	Navigant Report
TAPS Partners Program - Pipe wrap	17	4%	18	4%	Navigant Report
Furnace Replacements	385	82%	385	90%	Navigant Report
Thermostats ($15)	152	43%	146	43%	Navigant Report
RESIDENTIAL NEW CONSTRUCTION					
EnergyStar for New Houses	1,018	5%	1,018	5%	Navigant Report
LOW INCOME					
LI TAPS Partners Program - Pipe wrap	17	1%	18	1%	Navigant Report
LI TAPS Partners Program - Kitchen Aerators	22	1%	23	1%	Navigant Report
LI Prog Thermostats	152	1%	146	1%	Navigant Report
LI Weatherization program	1,143	0%	1,134	0%	Navigant Report
SMALL COMMERCIAL					
Air Doors	2,118	5%	667	5%	Navigant Report
Restaurants - CKV	3,660	5%	4,801	5%	Navigant Report
Restaurants - CKV2	5,960	5%	11,486	5%	Navigant Report
Restaurants - CKV3	10,910	5%	18,924	5%	Navigant Report
Restaurants - PRSV	3,059	5%	886	0%	Navigant Report - Large Restaurant
Rooftop Units	1,275	5%	255	5%	Navigant Report
Tankless Water Heaters	825	2%	154	2%	Navigant Report
Programmable thermostats	519	20%	310	20%	Navigant Report - Average

Table 3 illustrates the calculation of the SSM amount. The Market Transformation SSM in the original calculation is capped at the $450,000.

Table 3. SSM Calculation

	Original	Adjusted for Audit
2008 Actual TRC	$181,769,031	$182,706,679
2008 TRC Target	$168,276,583	$168,276,584
Percent of Actual	1.08	1.09
Base Target	75%	75%
Percent over 75%	33.02%	33.58%
$ per 1/10 of 1 %	10,000.00	10,000.00
SSM @ 75%	$2,250,000	$2,250,000
$ @ 10,000 per 1/10 of 1 % over 75%	$3,301,802	$3,357,522
Total Program Related	$5,551,802	$5,607,522
Market Transformation	$450,000	$318,825
Total SSM	**$6,001,802**	**$5,926,347**
Market Transformation Detail		
Energuide	$231,200	$231,200
Home Contactor	$152,867	
Boiler Market	$145,333	
Buisness Partners	$87,625	$87,625
Total	$617,025	$318,825

Review of Shared Savings Mechanism (SSM) Calculations

Cadmus reviewed the SSM from two perspectives. The first was whether calculations in the Total Resource Cost (TRC) spreadsheet were correct. (That is, we checked for any mechanical errors in the spreadsheet.) The second was whether inputs to the TRC spreadsheet were accurate and reasonable. Discussion of the inputs follows in individual program sections below.

TRC Spreadsheet Calculations

Cadmus reviewed the individual cells to assure the mathematical formulations were correct:

- Gross savings were a product of participation and unit savings.
- Net savings for prescriptive measures were a product of gross savings, free-ridership, and reduction factors for deemed-savings measures.
- Net savings for customer projects were a product of gross savings, the realization rate determined by the commercial and industrial studies, and the free-ridership rate:
    - Net savings for projects selected as part of the commercial and industrial samples were calculated as the product of savings determined by the respective study and the free-ridership rate.
    - Net savings for prescriptive school projects were calculated as the product of the prescriptive savings estimate and the free-ridership rate.
- Total benefits were the net present value of the product of net savings and the appropriate avoided cost value, based on the project's characteristics:
    - Gas, electricity and water.
    - Measure life.
    - Dominant end use (water heat, space heat, combined or industrial).
- Net incremental costs were calculated as the product of the number of participants, the per-unit incremental costs, and the free-ridership rate
- Net TRC benefits were calculated as the difference between the avoided costs and the sum of net participant costs and direct program costs. Direct program costs include:
    - Incentive payments for the cancelled EnerGuide for New Houses program.
    - Costs associated with market transformation programs.
    - Costs associated with program development and market research.

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Exhibit I
Tab 3
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Review of DSMVA Calculations

The draft DSM Annual Report for 2008 compares budgeted 2008 DSM expenditures with expenditures that actually incurred. Cadmus reviewed the OEB-approved three-year plan and confirmed the budgeted expenditures used in the DSMVA calculations match the plan. We also confirmed the 2008 actual expenditures in the DSMVA calculation matched the total DSM O&M included in the TRC worksheet. Our review did not include an audit of Enbridge's accounting records that form the basis of the DSM O&M amounts in the TRC worksheet.

Review of LRAM

Cadmus reviewed the LRAM spreadsheet provided by Enbridge. The review included a Web-conference, during which Enbridge staff walked the Cadmus team through the calculations. We find the LRAM spreadsheet accurately calculates the LRAM adjustment. On April 16, 2009, Navigant Consulting presented a comprehensive recommendation for measure savings to the OEB. With the exception of showerhead estimates (discussed below), we recommend adopting these savings for calculating the LRAM, as they represent the most current available savings estimates. This adjustment decreases the m^3 saved to 78,090,615 for LRAM. Table 4 illustrates the final LRAM adjustment amount.

Table 4: LRAM Calculation

2008 Audit Report LRAM Calculation					
	based on	56,244,500	FE m3 built into rates		
Rate	Budget Net Partially Effective	Actual Net Partially Effective	Volume Variance	Q1 Distribution Margin	$
Rate 1	8,246,394	7,361,104	885,290	~~7.6921~~	~~$ 68,097~~
Rate 6	7,148,028	9,568,648	(2,420,620)	~~4.0023~~	~~$ (96,879)~~
Rate 100	5,703,303	7,408,034	(1,704,731)	2.9427	$ (50,165)
Rate 110	2,019,518	1,040,042	979,475	1.6537	$ 16,197
Rate 115	1,285,148	2,167,715	(882,567)	1.0185	$ (8,989)
Rate 145	1,780,944	1,580,389	200,556	1.9481	$ 3,907
Rate 170	4,282,436	3,968,053	314,383	0.5595	$ 1,759
Totals	**30,465,771**	**33,093,985**	**-2,628,214**		~~**$ (66,073)**~~
Total Excluding Rate 1 and Rate 6					**$ (37,291)**

TRC Inputs

Prescriptive Savings Programs

In the residential sector we reviewed the following programs:

- TAPS
- Residential Equipment Replacement
- Residential New Construction
- Low Income

Our review consisted of a measure-by-measure comparison of the deemed values with savings assumptions used in other jurisdictions, most notably from Iowa (where Cadmus completed a statewide DSM potential study and program design effort in 2008) and, to a lesser extent, the California Database for Energy Efficient Resources (DEER). The savings for weather-dependent measures were adjusted to reflect the difference in heating degree days between Iowa and Ontario. Except where noted below, we found the savings, free-ridership, reduction factors, and measure lives to be consistent with both OEB-approved assumptions and the assumptions employed in other jurisdictions.

Showerhead

While the showerhead savings values were within the range of those used in other jurisdictions, this measure was the source of some debate in the last audit. Ultimately, Enbridge updated the savings to those determined by Summit Blue in its report titled "Resource Savings Values in Selected Residential DSM Programs" (dated June 4, 2008). Subsequent to completion of that report, Enbridge commissioned a study conducted by the SAS Institute of Canada, which found savings to be higher than those in the Summit Blue study. However, the SAS report notes:

> *For a more accurate extrapolation of yearly consumption, the SAS team recommends this analysis be redone after one year post-installation data are available. Further, control households with no low-flow showerhead installation should be included.*

We concur with the SAS recommendation, in particular the absence of a control group substantially increases the uncertainty of the findings. Using a larger sample size, longer post-installation data, and a control group would yield a more accurate estimate. In the interim, we recommend continued use of the Summit Blue estimates for the 2008 and 2009 SSM and LRAM calculations. We recommend that an updated study be performed before the 2010 program and that the resulting savings estimates be filed for approval with the OEB

We confirmed the participants reported in the DSM Annual Report represent households rather than showerheads installed. Savings assumptions in the TRC calculation are correct on a per-household basis.

Novitherm

The Novitherm savings estimation suffers from the same deficiencies noted by the SAS Institute in its estimation of showerhead savings. Notably, the study would benefit from a full year of post-installation data and a control group that did not have Novitherm panels installed. The use of a control group is necessary to account for exogenous impacts, such as economic changes. We

recommend a more comprehensive evaluation of this technology. Pending further evaluation, the OEB-approved savings estimate should continue to be used for SSM and LRAM calculations

EnergyGuide for New Houses

This program was rendered impotent in 2008 due to changes in the Ontario furnace standards. Enbridge did not include the program in its 2008 filing for program assumptions before the OEB; however, the OEB did not act on that application until December of 2008. As a result, the program continued to see participation through October of 2008. The consequence of the OEB ruling is that Enbridge did not have an approved program for 2008. For the 2008 Annual Report , Enbridge has excluded all savings and participant costs from the TRC, SSM and LRAM calculations; however, the program costs it incurred are included.

ENERGY STAR® for New Houses

The savings estimates for ENERGY STAR® for New Houses are comparable to those employed in other jurisdictions; however, we believe the free-ridership value is unrealistic. Typically, ENERGY STAR® residential new construction programs consist of two incentives:

- First, there is an incentive paid to the builder that covers the cost of certifying the home, and this certification incentive is typically about $400.
- Second, some portion of the incremental cost associated with meeting ENERGY STAR® savings criteria is provided as an incentive, and this incentive, which varies with the measures installed, may be several thousand dollars.

The program currently offers a $100 incentive to builders who have their homes certified as meeting the ENERGY STAR® standard. Enbridge has indicated it costs builders between $300 and $600 to have the homes certified. Because the certification cost is significantly higher than the incentive provided and no incentive is offered for the incremental cost of meeting ENERGY STAR® specifications, it is unlikely the incentive is a motivating factor. Enbridge has supported the ENERGY STAR® program since its inception through workshops and other promotional activities. Although this support has likely impacted the market beyond the program participation and $100 incentive, direct attribution of savings is difficult to determine.

For the 2008 program year, in the absence of specific research on free-ridership, the savings and attribution have been unchanged from the OEB-approved values; however, it is highly likely that the free-ridership under the current program design is significantly higher than the 5 percent approved by the OEB.

We recommend that Enbridge undertake a detailed free-ridership analysis and process evaluation of the program. The analysis should incorporate participating and non-participating builders and home buyers to determine the motivation behind building and purchasing ENERGY STAR® homes. Alternate program designs should be considered, including those providing incentives to cover a portion of the incremental cost of building to ENERGY STAR® specification and the certification process.

Prescriptive measures were installed in the following commercial programs:

- Small Commercial
- Multi-Residential

- Schools

Except where noted below, we found the savings, free-ridership, reduction factors, and measure lives to be consistent with OEB-approved assumptions and common industry practices.

Prescriptive Boilers in Schools

The savings for the prescriptive boiler program are based upon two reports by Agviro. These reports were reviewed as part of the previous (2007) audit, and Cadmus engineering staff reviewed them again for the 2008 audit. Results were based upon billing data analysis and modeling using E-Tools. No substantive flaws in the analysis were identified in either review.

However, we note that the demonstrated ease of use of E-tools for the custom commercial program suggests that a custom approach for this sector may be viable and would increase the confidence in the savings assumptions. We also note that the underlying reason for the Agviro report (published in 2007) was that "custom programs require significant supporting documentation to meet regulatory requirement (sic). In many cases it is difficult for the customer to estimate base case costs and incremental costs."[1] Enbridge's own statistics show a substantial number of schools involved in some custom projects (see Table 5), and the 2008 statistics appear to indicate that the burden of participation in custom projects is moot.

Table 5. School Participation in Enbridge Programs

	2007	2008
All Projects	46	96
Boiler Projects	45	57
Prescriptive Boiler Projects	29	48

We recommend accepting the 2008 claims for this program. However, we also recommend initiating a parallel custom savings calculation for schools and revisiting the program design in 2010, in the light of these additional data.

Custom Savings Programs

Custom savings program verification was undertaken by BII for commercial programs and by Genivar for industrial programs. These studies and the supporting documentation were reviewed by Cadmus engineering and audit staff. Both studies employed Summit Blue's recommended methodology for sampling.

We note that free-ridership factors were agreed upon, based on the 2008 study conducted by Summit Blue Consulting. A review of the study and a discussion with the authors confirmed the free-rider ratios were savings-weighted numbers based on surveys of 2007 program participants. It is entirely possible—even likely—the 2008 cohort is sufficiently different from the 2007 cohort that the ratios are no longer applicable and, thus, should be applied to individual projects with caution. Yet, in the absence of a new study, we accept the 2007 numbers for the 2008 participant group.

[1] Agviro Inc, Secondary Schools Prescriptive Savings Analysis, November 23, 2007, p. 1

The realization rate for agriculture custom projects was incorporated into the industrial program realization rate in the draft Annual Report. The sampling protocol developed by Summit Blue as a result of the 2007 audit incorporated the agriculture sample realization rates with the commercial projects. We recommend removing the agriculture realization rates from the industrial program and incorporating them in the commercial program to be consistent with the sampling protocol. This recommendation affects both the SSM and LRAM calculations.

Custom Commercial Programs

For commercial custom programs, the BII study did the following:

- examined 22 projects
- focused on verifying the input assumptions to E-Tools
- employed engineering reviews
- Conducted follow-one telephone conversations with customers

Adjustments were made to gas savings as well as to electric and water savings. BII reviewed Enbridge files, developed and included file review forms, replicated calculations (where necessary), and documented reasons for recommended changes to savings.

The study and supporting documentation were reviewed by audit engineering staff and found to be reasonable and consistent with standard industry practices. Some calculations were again replicated by staff, and no discrepancies were found.

While it is standard practice to use telephone verification for prescriptive and small custom projects, on-site verification is usually required for large and/or complex projects. We note that the sampling strategy accepted by Enbridge[2] involves dropping small projects from the sample frame and sampling from the largest stratum of projects. Verification site visits would increase the validity of the verification—although it may not change the results—and bring the verification effort up to industry best practices. We also note that water savings were adjusted by 38 percent because the verification contractor identified water savings that were not included in the initial Enbridge project savings estimate. From a statistical perspective, projecting the adjustment to the population of custom commercial projects is correct. However, it might also suggest a systematic under-reporting of water savings. . We encourage Enbridge to explore this issue for future program reporting.

The measure lives for the Large New Construction projects are currently listed as 25 years, and this measure life is approved for shell and boiler measures, which make up the majority of the savings. (However, other commercial measures have measure lives ranging from 10 to 20 years.) While we did not review the project files for commercial projects, it would be typical for such projects to have a very high percentage of savings resulting from the 25-year measures. Consequently, the impact of reducing the savings life by 5 to 15 years for a small fraction of the total savings will have a negligible impact on the overall SSM calculation. Nonetheless, we recommend that a weighted measure life be calculated for projects that have measures other than shell and boilers, based on the savings contribution of each technology for future TRC and SSM calculations.

We accept the realization rates determined by the BII study.

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[2] Memorandum, **Sample Selection for 2008 Custom Projects,** Summit Blue Consulting, December 19, 2008.

Custom Industrial Programs

A verification study was commissioned by Enbridge for industrial programs. The study, produced by Genivar, examined 15 industrial and 3 agricultural sites and included document reviews, site visits, verification of input assumptions, and examination of operating conditions. The terms of reference requires the consultant to ". . . review the input assumptions and replicate the engineering algorithms to verify that the savings and costs were correctly calculated."

Cadmus staff reviewed the Genivar report and determined that the report lacked descriptions of the verified engineering algorithms, baseline conditions, and equipment installed, which would allow for an adequate audit. Cadmus then discussed the report with Genivar staff members, who confirmed that they had relied on Enbridge's files to confirm the engineering savings estimates and that no additional back-up was available.

Enbridge provided Cadmus the detailed projects files, including input assumptions, detailed project descriptions, E-Tools screen shots, equipment descriptions, equipment invoices, savings calculations, measure costs, and incentives. Cadmus engineering staff then independently reviewed a sample of input assumptions and calculations and compared them to the Genivar conclusions. No differences or exceptions were noted.

We conclude that the savings estimates and adjustments made by Genivar are reasonable and consistent with current practice in the industry. The study and supporting documentation were reviewed by Cadmus staff and, together they provide a reasonable review, consistent with current industry practices. We accept the realization rates determined by the Genivar study. However, we recommend that, going forward, more systematic documentation and back-up be provided as part of the verification report.

Market Transformation Programs

A critical component of measurement of market transformation programs is the establishment of meaningful metrics that indicate a program is on a logical trajectory to transform the market, coupled with defensible market indicators (including equipment sales and surveys of current practice). The 2007 audit recommended a more systematic review of current indicators and the development of program logic models to develop performance metrics. Additionally, a recommendation was made to base claims on whether changes in current metrics were statistically significant. However, (1) no logic models were developed, (2) nor were any new indicators or metrics, (3) nor were any measures of statistical significance reported for assessing changes in current indicators.

We are also concerned with the weighting of the metrics and the treatment of metrics that exceed goals. For example, the Business Partners program includes a metric of targeting early adopters and top market players, but it assigns only a 5-percent weight to the metric. This metric is implicitly tied to a program theory based on diffusion of innovation, but does not appear to be appropriately weighted. On the other hand—as noted in the 2007 audit—program activities (such as number of workshops) are given substantial weight even though they may not be indicators of market transformation program effects.

Finally, the approved weighting structure allows for less-relevant metric performance to be exceeded and disproportionally contribute to SSM claims.

Consider the metrics, performance, and contribution to SSM of the Home Performance Contractor Market Transformation Program (Table 6).

Table 6. Metric reports, Weights and Performance

Metric	2008 Reported	2008 Target	Weight	Metric Performance	SSM
Contractor Training (events)	15	6	20%	250%	$50,000
Increase in Weatherization Frequency	.37	1	60%	37%	$22,200
Number of Participating Contractors	242	60	20%	403%	$80,667

Exceeding the number of workshops offered and the number of workshop attendees results in these two metrics contributing 85% toward the SSM, even though the metrics themselves might be inappropriate as market transformation progress indicators. For these reasons, the Market Transformation portfolio claims for 2008 suffer from the same shortcomings as the 2007 portfolio.

EnerGuide for Natural Fireplaces

Enbridge conducted a study of 357 purchasers of gas fireplaces. Results showed a substantial increase in awareness from previous surveys (80 percent of respondents up from 61 percent). Additionally, 74 percent of customers indicated that the label had an influence on their purchase decision. While the numbers are not tests of statistical significance, on face, the numbers appear to validate the SSM claim.

The method for gathering information from purchasers changed from the 2007 to the 2008 report. In 2007, customers were contacted by telephone at some time after the purchase had been made. In 2008, customers were intercepted in the store and offered a $50 inventive to participate in the survey.

There are essentially two major issues that could impact comparison survey results over time:

- changes in the survey instrument itself
- changes in the administration of the survey

Cadmus has confirmed that the wording of the questions for the metric has not changed. The issue for the audit is whether the survey implementation methodologies could have impacted the results.

Unfortunately, there is no clear answer. Intercept surveys are used in evaluation research because they provide immediate feedback when purchase decisions are fresh in consumers' minds. As such, they are very appropriate for a point-of purchase program such as EnerGuide for Natural Gas Fireplaces. Telephone surveys, while more common, have the disadvantage of introducing non-response bias (the incentive provided customers in the intercept situation are targeted at decreasing this bias), as well as giving customers more time to think about the decision and perhaps overestimate the program effect by rationalizing decisions already made. Or customers may have forgotten the reasons for making the original decision, and so they offer what they think is a socially acceptable response.

What we do know, however, is that a consistent approach to tracking and survey implementation produces the most reliable results over the long run. We recommend that Enbridge continue the current approach for this program, and we propose no changes to the 2008 claims.

Home Performance Contractor Market Transformation

Enbridge conducted surveys with attendees of a workshop for contractor and then conducted follow-up surveys some months later. Based upon self-reports from participants who responded to both initial and follow-up surveys (72 sets), Enbridge reported an increase of 0.37 (out of a 5-point scale) in the frequency of the top three weatherization measures.

While some progress may be attributable the survey participants, this study has several flaws, amongst which are:

- lack of clarity as to how this program and these changes would affect the market
- lack of comparable baseline data from nonparticipating contractors
- lack of measures of statistical significance in the metric change

For these reasons, we do not support the SSM claim for this program.

Boiler Market Transformation Program

This program appears to be unchanged from the 2007 program, for which the previous auditor recommended no SSM payments. The relationship of the metrics to market transformation has not been clarified, nor has the relative weighting of the metrics. The survey of workshop participants immediately before and immediately after the workshop is not a reasonable indicator of retention of information and future action. Changes in levels of awareness were reported by percentages, but no indication of the number of participants was included in either the annual report or the Enbridge presentation of results.

For these reasons we recommend, again, that the SSM claim for this program be rejected.

Business Partner Market Transformation

This program shows substantial improvement, as it now includes follow-up surveys to verify post-workshop behavior and an implicit program theory (as indicated by the inclusion of a metric entitled "identify and target top market players/early adopters" as part of the approved metrics). Enbridge identified 248 "top HVAC design and installation firms" for the 2008 program, in addition to those identified in 2007.

Enbridge conducted follow-up surveys with 2007 workshop participants, focusing on air-doors and DCV. Surveys included information on measure recommendations since the seminars. Participant behavior was broken out by respondents who had never recommended the measures before the seminars and respondents who had recommended them previously but were now recommending them more frequently.

Results showed what appeared to be a significant increase in new recommendations for these two measures in both groups (although no statistical measures of significance were presented).

Additional workshops were held in 2008 with another set of business partner representatives. Once again, immediate pre- and immediate post-workshop surveys were implemented. We question the usefulness of these surveys by themselves, but recognize their value for future evaluations.

Because of the improvement in program and evaluation design and in the development of linkages to program and market transformation theory, we support the SSM claim for this program.

Recommendations

Based on the audit, we offer the following recommendations for Enbridge:

Change the measure life assumption for steam traps to six years for LRAM until better data are available. The six-year measure life, which is the most recent update to the California DEER database, is a number weighted for high-, medium-, and low-pressure applications. Current Enbridge documentation supporting an increase in steam trap measure life from three to 13 years is based on analysis of four sites, and it uses a straight line projection rather than the industry-standard logistic curve for survival functions. Enbridge could calculate a utility-specific steam trap Effective Useful Life (EUL) estimate by simply (1) gathering data on the age of replaced steam traps on the next 100-150 replacements, as part of the current custom programs, and (2) applying a conventional statistical package to the data (for example, SAS PROC LIFETEST). We encourage Enbridge to undertake this activity. This recommendation affects the SSM in future years.

Update the SAS shower head load study pursuant to the recommendations included as part of the report. These recommendations include (1) performing re-analysis after one-year post-installation data are available, and (2) employing a comparative household sample with no installation (to control for trends).

Conduct a comprehensive evaluation of the Novitherm program. As noted in the Novitherm review, savings estimates suffer from similar shortcomings as those identified in the showerhead study. We recommend analysis using a full year of post-installation gas usage, as well as the inclusion of a control group.

Remove the agriculture custom project realization rates from the industrial program and incorporate them into the commercial program results. This recommendation would make the reporting consistent with the sampling protocol.

Include systematic documentation and back-up for industrial program verification report. Because the report did not include sufficient documentation for audit review, our auditors had to request project files from Enbridge to examine baseline conditions etc. These data should have been included in the report.

Implement a process to ensure consistent survey implementation approaches over time for Market Transformation programs. This is important because Market Transformation progress can only be understood over time. Where survey approaches change, an assessment of construct validity should be provided.

Revise ENERGY STAR® program. We recommend Enbridge undertake a detailed free-ridership analysis and process evaluation of the program. The analysis should incorporate both participant and nonparticipant builders and home-buyers to determine the motivation behind building and purchasing ENERGY STAR® homes. Alternate program designs should be considered, including providing incentives to cover a portion of the incremental cost of building to ENERGY STAR® specification and the certification process.

Document the decision rules for categorizing individual replacements versus advancements for custom projects. A total of 485 custom boiler installations were reported for 2008. Approximately 67 percent (327) were categorized as "advancement," while 158 (33 percent) were characterized as "replacements." Enbridge staff informed the auditor that that the categorization

was made as a result of discussions with the customer; however, there was no specific documentation provided for each decision.

The characterization is important because the TRC savings for the advancement case is based upon the difference between the existing equipment and the new equipment for the period representing the remaining useful life of the original equipment. At the end of the useful life estimate for the old equipment, the remaining savings are calculated as the difference between the new equipment and current practice or code. For the replacement scenario, all of the savings are the difference between the new equipment and a current practice or code baseline.

Current practice in the industry is that *only* a decision to install new equipment before the end of the assumed measure life that is *attributable to utility intervention* should be categorized as advancement. Any independent decision by a customer to install new equipment should be categorized as a replacement, regardless of equipment age. Specifically:

1. If a boiler is replaced beyond its effective useful life (if a boiler is older than 25 years), it should be categorized a replacement.
2. If a boiler burns out or is inoperable, regardless of its age, it should be categorized as a replacement.
3. If a customer had already decided to replace a boiler, regardless of age or condition, it should be a replacement.
4. Installing new equipment is should be characterized as advancement only when there is evidence that the utility program convinced the customer to replace an operating boiler before the end of its effective useful life.

Enbridge's approach, which bases the determination of advancement versus replacement on discussions about the project with the customer, is consistent with current industry standards, but the documentation for the decision is not. We recommend that Enbridge (1) develop formal rules for determining when a custom installation is to be characterized as an advancement or a replacement, and (2) require documentation when the decision is made to characterize a project as advancement. Ideally, this documentation would involve recording customer responses to a specific question or questions.

Evaluation and verification studies in support of annual reports need more time and should be planned and initiated earlier. Final reports were only available in April or May, and one author noted that all site visits and file reviews were performed in one month. This may account for the fact that baseline conditions were not well documented in the industrial verification report and that copies of the project files were supplied to the auditors independently by Enbridge for review.

Conduct site verification visits for commercial custom project verification studies. It is standard practice in evaluation to conduct some telephone verifications usually for simple or small projects. However, for larger custom projects, verification site visits are the standard. Site visits were implemented for the industrial sample, but not for the commercial sample. We recommend that future custom commercial verification studies require site visits.

Conduct annual free-rider surveys for custom project participants. The free-rider adjustments currently used by Enbridge custom commercial projects are based on a survey of 2007 participants. More importantly, the free-rider estimates are savings-weighted averages applied to the 2008 cohort. If the mix of measures, project verified savings, business type, and decision-maker vary from year to year, so will the free-rider estimate. Enbridge has an accepted methodology and approach for

calculating free-ridership ratios, so replication of these ratios for the 40 or 50 participants should not be a burden. Survey information could be gathered by telephone or in conjunction with verification site visits. This recommendation will affect both SSM and LRAM in future years.

Stratify savings calculations for pre-rinse spray nozzles. The savings for this technology is highly dependent on the nature of the commercial operation. CEE notes that small restaurants spray rinse approximately one hour per day; medium-sized restaurants spray rinse 1.5-2 hours per day; and large cafeteria operations spray rinse 3 to 4 hours per day.[3] The prescriptive savings for this measure is based on assumed usage of 3.75 hours per day. The daily usage was determined by a study conducted in 2003, weighted by the number of restaurants surveyed. We recommend that savings be stratified by the nature of the commercial operation in which they are installed. This approach is incorporated in the Navigant study that was adopted by the OEB for use in 2010. Alternatively, the weighted average should be updated on an annual basis based on the actual participation in the program year. This recommendation will affect both SSM and LRAM in future years.

Reconsider the Prescriptive Schools Program design after additional data collection activities. The details required to conduct energy savings calculations in E-Tools do not appear to add burden on participants or staff. The tool has proven easy to use, elegant, and flexible. Once a history of school boiler project savings has been accumulated (using the prescriptive savings algorithm), the program design might be reconsidered. This recommendation may affect both SSM and LRAM in future years.

New construction measure life estimates should be savings-weighted. Currently, measure life for new construction is based on the life of the longest-lived measure. In keeping with industry current practice, this should be changed to calculate overall measure life by weighting individual component annual savings measure lives in proportion to lifetime savings. This recommendation will affect both SSM and LRAM in future years.

Develop logic models and market progress indicators for market transformation programs. This recommendation was made in the 2007 report, but has not been implemented. Consequently, it was not possible to recommend even partial SSM return for several market transformation programs, because linkages to market transformation were not established. It should be noted that the Business Partner Market Transformation Program has shown significant improvement in demonstrating an implicit model and theory. More formal program logic and metrics are still required. Future SSM returns should not be considered without these products. This recommendation will affect SSM in future years.

Develop a comprehensive third-party evaluation strategy and schedule. Program evaluations seem to be *ad hoc* and lack an overall strategy and framework. While some Enbridge administrative and support activities are exemplary and represent industry best practices (for example the QA/QC on the TAPS program), the *ad hoc* nature of the evaluation activities produces a wide range of products (some of which are, indeed, excellent). Programs do not necessarily need to be evaluated every year, but they do need an overall strategy and plan for each program cycle, including both process and impact evaluations. Third-party evaluation avoids the appearance of a conflict of interest. The reports should also be publically available for review, and future free-ridership and

[3] http://www.cee1.org/com/com-kit/prv-guides.pdf

savings should be based on the evaluated results. Best practices in program evaluation have budgets in the range of 3 to 6 percent of program expenditures. A comprehensive evaluation program for Enbridge could require a budget of $1,000,000 per year. This recommendation will affect both SSM and LRAM in future years.

Document program process flows and QA/QC procedures. Program process flows and QA/QC procedures were described in great detail, and they reflect some industry best practices; however, no back-up documentation was available. Enbridge would be well-served to develop these flows to facilitate future audits as well as to provide both internal management oversight and input to process improvement.

Review Commercial Custom Program water savings protocols. The verification report for this program found water savings for projects where no water savings were identified by Enbridge. A review of the program protocols and models related to water savings is warranted. This recommendation will affect both SSM and LRAM in future years.

EAC Comments and Recommendations

During the course of the audit analysis—and as a result of a review of the Draft Annual Report and the Draft Audit Report—the EAC offered the following comments and recommendations:

Provide a linkage between historical and current audit. We have included the Auditor, EAC and Enbridge comments and recommendations from the 2007 audit in Appendix B. This appendix also indicates the disposition of each recommendation. During the course of the current audit, we have verified the disposition of these recommendations and have noted the recommendation as appropriate in the preceding program discussion.

Include a summary table with original and audited savings, SSM and LRAM values. A summary table has been added to the introduction.

Describe rational for accepting 25-year measure lives for certain custom commercial projects. We added language describing the rational for accepting 25-year measure lives for certain custom commercial projects that include shell measures, boilers, and other measures.

Clarify program specific recommendations impacts on SSM and LRAM. We added language to indicate whether adjustments recommended by the audit affect the SSM, LRAM, or both.

Verify that the costs for all delivered measures are included in the TRC calculation, whether installed or not. We verified that (1) the TRC costs are based on all delivered measures and (2) savings are based on only those measures for which installation has been verified through program surveys or other verification methods.

Compare number of projects with negative TRCs between 2007 and 2008 program years. Each of 2007 and 2008 program years had approximately 1,000 commercial and industrial custom projects. Of the commercial and industrial custom projects, 147 projects had negative TRCs in 2007 while 76 projects had negative TRCs in 2008 (all of which were included in the TRC calculation). The decline in negative TRCs is indicative of increased pre-screening by Enbridge staff.

Apply best available information for LRAM calculation. We have assumed the Navigant study recently adopted by the OEB to be the basis for the LRAM savings calculation (with the exception of showerhead savings). Navigant adopted the results from a recent study conducted by SAS that we believe to be fundamentally flawed, as discussed above. Until a study is conducted that overcomes the flaws noted by SAS in its analysis, we do not believe the higher level of savings is warranted

The linkage between market transformation metrics and market outcomes is not clear. We agree with this general statement. As indicated above, we find that two of the market transformation program linkages are so vague as not to warrant any SSM payment. In all cases, the market transformation tracking metrics should be revisited to establish a clear linkage with market outcomes.

Individual market transformation metric performance should be capped at 150% of target. We agree that a cap on individual metric performance is important to preserve the weighting of each metric. However this is a policy issue that must ultimately be determined by Enbridge, interested parties, and the OEB.

Clarify "participant" for the Novitherm program. The Novitherm savings and participation is based on an average participating household.

SAS showerhead study suffers from serious flaws. As we noted in the body of this report, the SAS Institute indicated that the showerhead study it conducted suffers from two serious deficiencies: (1) the study period should be longer, and (2), the participant group needs to have a non-participating control group. We agree that the study is flawed and recommend that the currently approved showerhead saving values be used until a more robust study can be conducted.

Appendix A: Documents Reviewed

OEB Documents

Decision in Docket EB-2006-0021 (August 2006)
DSM Handbook – EB-2006-0021 (April 2006)
Enbridge 2008 DSM Variance Clearance Application in – EB-2008-0271 (August 2008)
Decision Phase III EB-2006-0021 - January 2007
Market Transformation Revision – February 2007
2008 Approved Assumptions EB-2008-0384 (January 2009)
Draft DSM Guidelines - EB-2008-0346 (January 2009)
2010 Approved Assumptions – EB-2008-0346 (April 2009)
- Navigant Report
- GEC comments on Navigant Report

2007 Annual Report and Audit

2007 Audit Comments

2008 DSM Draft Annual Report

2008 Draft Annual Report Comments received from GEC

Research Studies

Energy Efficient Boiler Systems Market Place – Agviro
Comparison of ENERGY STAR and Ontario Building Code - Bowser Report
Custom Projects Attribution – Summit Blue
Residential Attribution – Summit Blue
Residential Measure Savings – Summit Blue

Verification Studies

Industrial project sample – Genivar
Commercial project sample – BII
2008 Boiler Market Transformation – Enbridge
2008 Business Partner Market Transformation – Enbridge
2008 Energuide for Natural Gas Fireplaces – Enbridge
2008 Home Performance Contractor Baseline Study – Enbridge
2008 Home Performance Contractor Followup Survey – Enbridge
2008 MultiRes Showerhead – GFK
2008 Novitherm Study – Enbridge
Impact of low-flow showerheads – SAS
GEC comments on SAS low-flow showerhead study
2008 TAPS survey – Quadra Research

Custom Project Sampling Methodology

Report on the Process of the Evaluation and Audit Committee of Enbridge Gas Distribution for the 2007 Year

Appendix B: 2007 Audit Recommendations

Status Report: 2007 Audit Recommendations

Prepared for the 2008 Audit

April, 2009

Introduction

This report follows the Audit Summary Report from the 2007 audit. For each audit recommendation a status update re: 2008 has been added.

A. Auditor Recommendations

ECONorthwest obtained the SSM calculations from Enbridge and then replicated and checked for the following:

- Accuracy with the final savings totals shown in the Annual Report
- Consistency with the agreed upon assumptions for calculation parameters (e.g., free ridership, per unit savings, savings adjustments)

This resulted in one recommended correction to the Novitherm free rider rate as noted below.

1. **Recommendation:**

   Adjust the Res. **Novitherm free rider** rate from 1% to zero (value approved by OEB).

   Enbridge Response:

   Enbridge recalculated the program results to correct this clerical error.

   2008 Status: This correction was included with Enbridge's 2008 Assumption Update which was subsequently approved by the Ontario Energy Board (the Board). This

   Resolved

The balance of this section records the Auditor's recommendations re: adjustments to TRC Results based on application of evaluation study findings.

2. **Recommendation:**

   Reduce the Res. **Novitherm installation** adjustment from 85% to 76% based on the rate of completed installations as determined from the Enbridge Novitherm installation survey.

   Enbridge Response:

   Enbridge recalculated the program results as recommended to discount participants who indicated that they would install the panels within the next six months and to only count those participants who had actually installed the panels.

   2008 Status: Enbridge followed this methodology in calculating the installation rate for 2008 participants.

Implemented

3. **Recommendation:**

Adjust the **low income TAPS installations** using the same installation adjustment factors used for the other residential programs.

Enbridge Response:

Enbridge recalculated the program results for 2007 to apply the general TAPS installation rate to low income participants. The number of low income participants in 2007 was too small to ascertain a separate installation rate through the follow-up survey. As participation in the Low Income TAPS program increases, Enbridge will consider administering a separate Follow-up survey to this group of participants.

2008 Status: In 2008 Enbridge conducted a follow-up survey of low income participants and applied a separate installation rate.

Implemented

4. **Recommendation:**

Reduce the total **custom commercial gas savings values** by 2.3 percent and the **Custom industrial gas savings value**s by 3.6 percent based on the findings from the evaluation studies.

Enbridge Response:

See item #5 below

5. **Recommendation:**

Subsequent to the Final Audit Report (July 23, 2008), a memorandum was distributed to the 2007 EAC with a recommendation that the results of an **additional detailed custom file review** be applied to all custom projects.

Enbridge Response:

Enbridge proposed by way of compromise an overall blended reduction factor for gas savings in the Commercial and Industrial sectors to include results of the auditor's custom project review as well as the engineering review (5.3% for Commercial and 5.5% for Industrial). This method would help maintain the statistical significance used in selecting the original sample. The EAC agreed to this on the basis, as recommended by the Auditor, that this is a transitional solution for 2007 only, and that improvements in the process for 2008 should be implemented. In the auditor memo of July 23rd, the auditor agreed that this approach would yield an appropriate adjustment factor for 2007, subject to its comments about future applicability of the compromise approach. Enbridge subsequently worked with the auditor to adjust the Commercial and Industrial gas savings accordingly.

2008 Status: This recommendation is specific to 2007 and not applicable to 2008 results.

Not Applicable

6. **Recommendation:**

Use the **prescriptive schools boiler savings values** from the Agviro reports for 2007 only for those sites that are considered to be part of the prescriptive schools program.

Enbridge Response:

Enbridge included the prescriptive boiler savings for selected elementary and secondary school projects in the 2007 DSM Annual Report results.

2008 Status: In 2008, Enbridge continued to apply prescriptive boiler savings only to those projects that are part of the prescriptive schools program.

Implemented

7. Recommendation:

Reduce the SSM incentive amounts for the market transformation programs to $178,151.

Enbridge Response:

The Company pointed out that the Ontario Energy Board may assign SSM incentives for milestones in market transformation programs beyond market effects. "The Board remains satisfied that market outcomes should not be the exclusive metric for shareholder incentives."[4] Enbridge expressed concern that where the Company has met the performance of an approved metric, the SSM should apply. Changes to market transformation SSM metrics should only apply going forward. To expedite resolution of the 2007 results, Enbridge recalculated the Market Transformation SSM calculation for 2007 as recommended.

Enbridge acknowledged the Board's "… expectation that continuous improvement can be achieved within the new long term collaborative framework."[5] Further to the auditor's report, Enbridge intends to work to improve evaluation methods for the market transformation programs in consultation with the EAC. Further, Enbridge will investigate the application of the program theory and logic model approach to at least one market transformation program for 2009 and submit any resulting proposed change in program metrics to the Board for approval.

2008 Status: Enbridge has consulted with the EAC re: market transformation programs, investigated the program theory and logic model approach and submitted revised 2009 program metrics to the Board for approval. Enbridge is continuing to investigate the program theory and logic model approach for application to market transformation programs in 2010 and beyond.

In Progress

B. EAC Recommendations

8. Recommendation:

Adjustments re: **non-installs resulting from the TAPS Follow-up Survey** should be reflected only in the savings of those participants. There should be no change to the incremental costs.

Enbridge Response:

Enbridge reviewed the treatment of the non-install adjustment for TAPS showerheads, TAPS aerators and Novitherm panels and revised the TRC calculation where necessary to ensure that all incremental costs remain in the TRC calculation for programs with non-install adjustments.

2008 Status: This recommendation was implemented in the calculation of 2008 TRC results.

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[4] EB2006-0021,Ontario Energy Board, Decision and Order Phase III, page 5.

[5] EB2006-0021, Ontario Energy Board, Decision and Order, Enbridge Gas Distribution Inc. – Market Transformation Incentive Metrics, page 4.

Implemented

9. Recommendation:

Calculation of savings for custom projects in **Large New Construction** should reflect the introduction of the new Building Code effective April, 2007.

Enbridge Response:

Enbridge reviewed the documentation for all Large New Construction projects included in the 2007 Annual Report and determined that there was one project where the building permit was issued after April 2007. Enbridge adjusted the savings claim for this one project.

2008 Status: In 2008 Enbridge continued to monitor the date of building permit issue and adjust project savings as necessary.

Implemented

10. Recommendation:

The wording in the Board Decision from the Generic Proceeding is ambiguous re: treatment of **negative projects** in results. Negative projects should be either entirely on the books OR entirely off the books. If removed, the project spending should be removed entirely from the DSM budget and DSMVA. Alternatively, the negative projects may be left entirely in the TRC calculation.

Enbridge Response:

In the Annual Report, Enbridge interpreted the Board's Decision to mean that all aspects of the project should be removed from the TRC calculation except for the incentive costs which should be treated as direct cost with a negative impact on the TRC. Following the EAC's recommendation, Enbridge included all aspects of the negative projects in the TRC calculation, budget and DSMVA.

2008 Status: This recommendation was implemented in the calculation of 2008 TRC results.

Implemented

IV LRAM

A. Auditor Recommendations

11. Recommendation :

ECONorthwest recommended that the adjustments based on changes in water temperature and throttling be omitted from the **savings estimates for low flow showerheads** outlined in the Summit Blue Savings Values for Residential Prescriptive Programs Study.

ECONorthwest recommended the following savings values for showerheads: 51m^3, 78m^3 and 117 m^3 for replacement of showerheads at 2, at 2.1 to 2.5 and over 2.6 gallons per minute flow rate. The EAC recommended applying the Summit Blue recommendation instead EcoNorthwest recommendation.

Enbridge Response:

The Company is willing to accept the application of Summit Blue recommended Deemed Savings study results for 2007 LRAM. Enbridge recalculated the showerhead savings accordingly.

The Company's agreement is based on the understanding that these adjustments for 2007 LRAM (with the exception of the item discussed in Recommendation #15 below) are used for setting the 2008 target and for tracking 2008 actual results. Given that we are half way through 2008, this will enable Enbridge to finalize the 2008 target and make 2008 decisions based on this information. Any changes to these values in 2008 will be used for 2008 LRAM purposes only and will not affect the 2008 target or actual.

2008 Status: Enbridge included the Summit Blue recommended savings values in the 2008 Assumption Update which was subsequently approved by the Board.

Implemented (EAC recommendation**)**

12. Recommendation:

ECONorthwest recommended that the Summit Blue estimates for **programmable thermostats and aerators** be adopted until a study can be conducted by Enbridge to develop savings estimates that are tailored to its own customers.

Enbridge Response:

The Company is willing to accept the application of Summit Blue recommended Deemed Savings study results for 2007 LRAM. Enbridge recalculated the volumetric savings for programmable thermostats and aerators using the Deemed Savings as recommended by Summit Blue and the auditor.

See Recommendation #11 re: application of these adjustments to the 2008 target and tracking of actual results.

2008 Status: Enbridge included the Summit Blue recommended savings values in the 2008 Assumption Update which was subsequently approved by the Board. Enbridge has not pursued a new study for thermostats and aerators.

Implemented (for 2008)

13. Recommendation:

ECONorthwest recommended that the **free ridership rates from the Summit Blue Free Ridership Study** not be used for the 2007 (or future) programs. Until a different free ridership estimate can be completed, ECONorthwest recommended that the previous free ridership values be used for these measures.

Enbridge Response:

In Enbridge's view the study was developed by a firm with acknowledged expertise in the field of free ridership and spillover, the study results are reasonable and the net to gross ratio should be applied. The EAC expressed several concerns with using the spillover results and recommended that only the free rider values from the study be applied to the 2007 LRAM and that the spillover issue be referred to future policy discussion with the Consultative.

The Company is willing to accept the application of Summit Blue recommended free ridership rates (ie. excluding spillover) for 2007 LRAM settlement. Enbridge recalculated the savings for showerheads, aerators, programmable thermostats and furnaces using the free ridership values recommended in the Summit Blue study.

See Recommendation #11 re: application of these adjustments to 2008 target and tracking of actual results.

2008 Status: In the 2008 Assumption Update Enbridge submitted the Summit Blue free ridership values; these were subsequently approved by the Board.

Resolved

14. Recommendation:

Use a gross savings estimate of 28.3 therms for **multi-family clothes washer replacements**. This assumes a new, standard efficiency clothes washer as the baseline rather than the existing machine.

Enbridge Response:

Enbridge has concerns about assuming a new, standard efficiency clothes washer as the baseline since this assumes that the program is directed to capturing scheduled replacements rather than discretionary retrofits. For the 2007 LRAM Enbridge calculated the multi-residential washer savings using the recommended deemed savings. Enbridge has added this item to the list of 2008 research priorities.

2008 Status: Enbridge investigated savings for multi-residential clothes washers but did not have results available for the 2008 Assumption Update. The Board approved continued use of the original assumption of 342m^3 savings for 2008. Enbridge submitted a revised savings value in the 2009 Assumption Update.

Resolved

B. EAC Recommendations

15. Recommendation:

The EAC reviewed the Summit Blue Draft Report for Custom Project Free Ridership and Spillover. The EAC acknowledged that **spillover** was included in the study Terms of Reference and recommended that the net to gross values recommended by Summit Blue be applied to the 2007 LRAM but with no precedent value for use in 2008. The Committee further recommended that the issue of spillover for 2008, TRC and SSM purposes be referred to the Consultative for policy discussion.

Enbridge Response:

In Enbridge's view the study was developed by a firm with acknowledged expertise in the field of free ridership and spillover, the study results are reasonable and the net to gross ratio should be applied.

The Company accepts the application of the Summit Blue recommended net to gross values (including spillover) for 2007 LRAM. Enbridge recalculated custom project volumetric savings using the program-by-program values from the draft Summit Blue study.

Re: application of these adjustments to the 2008 target and tracking of actual results, the Company intends to continue discussion around the issue of spillover with the DSM Consultative at the policy level. Following this discussion, the Company may submit notice to the Board and the parties that the 2008 target is proposed to be adjusted to reflect a 2007 LRAM calculation including the spillover results for custom projects. If approved by the Board, the same net-to-gross value will be applied to 2008 actual results as used for the 2008 target. In the interim the 2008 target will be calculated without spillover included using the program-by-program values from the draft Summit Blue study.

2008 Status: In the 2008 Assumption Update**,** Enbridge submitted net to gross values (including spillover) for the custom projects. The Board Decision directed Enbridge to apply only the free rider rate to custom projects for 2008. The Company then circulated to all parties a revised Assumption Table reflecting the Board's Decision. In the 2009 Assumption Update Enbridge submitted spillover values for all measures where the information was available. It is expected that the Board will invite comments from intervenors on the 2009 Assumption Update.

In Progress

VI Future Research and Savings Calculations

A. Auditor Recommendations

ECONorthwest recommended that the following adjustments be made to future DSM claims (2008 onward).

16. Recommendation:

Adjust **showerhead and thermostat per unit savings** based on the Summit Blue studies using adjustment discussed in this audit report.

Enbridge Response:

Enbridge is undertaking a load research study of showerhead savings in consultation with the 2008 EAC. Enbridge will also discuss the application of the Summit Blue results for thermostats with the EAC.

2008 Status: In the 2008 Assumption Update Enbridge submitted the showerhead and thermostat savings as recommended by Summit Blue; these values were subsequently approved by the Board. Enbridge began load a load research study of showerhead savings in 2008 but the results were not available for the Update submission. Enbridge included the showerhead load research results in the 2009 Assumption Update which is currently before the Board. Enbridge has not as yet discussed the Summit Blue results for thermostats with the EAC.

In Progress

17. Recommendation:

Apply TAPS installation adjustments to **multi-residential showerhead and aerator installations** until a study can be conducted addressing the multi-family sector.

Enbridge Response:

Enbridge has begun work to design an appropriate non-install study for multi-residential showerheads and will consult with the 2008 EAC.

2008 Status: Enbridge completed a third party study of 2008 multi-residential showerhead installations and incorporated the findings in the 2008 TRC calculation.

Implemented

18. **Recommendation:**

Revise as needed the **prescriptive school savings values** based on new information on the base case conditions.

Enbridge Response:

Enbridge will review the Agviro Report and the auditor's comments with the 2008 EAC.

2008 Status: Enbridge has not yet reviewed the Agviro Report or the auditor's comments with the 2008 EAC. In their review of the 2010 Assumptions, the Board's consultant, (Navigant Consulting) endorsed the Enbridge savings values.

Follow-up needed

19. **Recommendation:**

For **Novitherm panels**, only use survey results for customers that have actually installed the panel to calculate the installation adjustment factor.

Enbridge Response:

This issue was addressed in the SSM recommendations. For 2008 forward, Enbridge agreed to exclude the responses of those participants who intend to install the panels within six months and only use responses from customers who actually installed the panels.

2008 Status: As indicated, in calculating 2008 results, Enbridge used only responses from customers who actually installed the panels.

Implemented

20. **Recommendation:**

All projects in the sample included natural gas savings. There were only a handful of **projects with electrical savings** reviewed by third party engineers and no projects were reviewed with **water savings**. Given the very small sample sizes, ECONorthwest indicated there was no basis for auditing or adjusting the electricity and water savings claims and that these samples must be increased in future years so that the kWh and water savings estimates can receive an adequate review.

Enbridge Response:

Sample used for review by the third party independent engineering firms met OEB requirements and was statistically significant. In conjunction with the EAC, Enbridge will review the sampling methodology for application to the 2008 custom project evaluation work.

2008 Status: Enbridge, together with Union Gas, worked with their respective EACs to develop a sampling methodology for 2008 which included electricity and water savings. This sampling methodology was then used to select the custom projects for the engineering review.

Implemented

EcoNorthwest made the following recommendations regarding future evaluation research.

21. Recommendation:

Conduct a new **residential free ridership study** with the survey questions and scoring methods thoroughly vetted prior to fielding the survey**.** This will allow for a study to be completed that provides results that can be applied to the savings estimates. EcoNorthwest also recommended a method that utilizes fewer questions with a less complicated weighting scheme. Having the survey questions and scoring method reviewed prior to fielding the survey will help ensure that the study produces results that can be used in the net savings calculations.

Enbridge Response:

Study was conducted by a qualified independent consultant. RFP and consultant selection was completed with input from EAC. Enbridge will discuss the application of the Summit Blue residential free ridership study results and any subsequent new residential free ridership study with the 2008 EAC.

2008 Status: Enbridge has not discussed the application of the Summit Blue residential free ridership study results with the EAC or initiated a new residential free ridership study.

Follow-up needed

22. Recommendation:

Develop **savings values for showerheads** using a sample of metered Enbridge customers. Meter tests for showers. Enbridge should conduct a study on low-flow showerheads that involves metering a randomly selected sample of participants before and after the new showerhead is installed. The sample should be large enough and cover enough housing types (single family and multi-family at a minimum) so that the results can be extrapolated to the population.

Enbridge Response:

Enbridge has begun work to develop such a study and has circulated a study proposal to the 2008 EAC for comment.

2008 Status: Enbridge initiated a showerhead load research study for single family homes in 2008. Following consultation with the EAC Enbridge engaged a third party firm to conduct the statistical analysis of the load research findings. Results were not available for the 2008 Assumption Update submission. The study was completed in 2009 and results included in the 2009 Assumption Update submission. In the 2009 Update Enbridge adapted the work of Summit Blue from the single family sector to develop savings estimates for the multi residential sector.

Implemented

23. Recommendation:

For future program years we strongly suggest that new metrics be established for **market transformation programs.** Create formal logic models and program theory documents for these programs. For the market transformation programs, it is important to develop program logic models and associated program theory to articulate what each program is attempting to achieve. These logic models will clearly show the program activities, the associated direct outputs, and how these outputs will result in short-term, mid-term, and long-term market outcomes. NYSERDA has done extensive work developing these models for their programs and these will serve as a good template for what is needed for the Enbridge market transformation programs.

Progress on the various market transformation metrics should also be calculated using confidence ranges (i.e., 90 percent confidence level with an error of +/-10%). Incentives should only be paid on those metrics that show improvement that is statistically significant.

Enbridge Response:

Enbridge will review the market transformation program evaluation methods and metrics for 2009 (see item #7 above) and the next Multi-year plan.

2008 Status: Enbridge has consulted with the EAC re: market transformation programs, investigated the program theory and logic model approach and submitted revised 2009 program metrics to the Board for approval. Enbridge is continuing to investigate the program theory and logic model approach for application to market transformation programs in 2010 and beyond.

In Progress

24. Recommendation:

Use the logic models and program theory to develop performance metrics for **market transformation programs**. Once the logic models and program theory have been developed, specific metrics should be developed that measure the various links between program activities, outputs, and outcomes. Progress on these metrics will then serve as the basis for all evaluation activities for these programs. As discussed previously, activities performed by the program should not be considered as metrics of market transformation (although these were the metrics set for the current programs).

Enbridge Response:

As above, Enbridge will review the market transformation program evaluation methods and metrics.

2008 Status: see above item #23

25. Recommendation:

Use larger samples for **engineering review**, covering the major equipment types and end uses. Future engineering reviews should utilize larger project samples so that statistically representative samples for the major measures and end uses within sectors are represented. This will allow the sample results to be extrapolated to the population with a greater degree of confidence.

Enbridge Response:

Enbridge will review this recommendation and discuss with the 2008 EAC.

2008 Status: Enbridge has not as yet discussed this recommendation with the EAC.

Follow-up needed

26. Recommendation:

Create separate samples to cover **projects with electricity and water savings.** A separate and larger sampling method and file review should be done for projects that involve electricity and water savings as these are savings amounts that can contribute to net benefits. The 2007 samples had only a few electricity projects and no water projects. Consequently, the savings calculations received very little review by the 3rd party engineers and no review by the auditor.

Enbridge Response:

Enbridge will review this recommendation and discuss with the 2008 EAC.

2008 Status: Enbridge, together with Union Gas, worked with their respective EACs to develop a sampling methodology for 2008 which included electricity and water savings. This sampling methodology was then used to select the custom projects for the engineering review.

Implemented

27. Recommendation:

More project detail needed in the **engineering review report.** For the projects reviewed by the 3rd party engineers, much more detail should be made available. This includes any engineering site or design reports, documentation of assumptions used to calculate savings, information on existing equipment, printouts from e tools, and any other information that is necessary for an auditor to see how savings are calculated.

Enbridge Response:

Enbridge will review this recommendation and discuss with the 2008 EAC with a view to more clearly defining the respective roles of the engineering review evaluation studies and the auditor.

2008 Status: Enbridge discussed requirements re: the engineering review reports with the 2008 auditor prior to the completion of the reports to ensure that all needed information would be available for the auditor's review.

In Progress

28. Recommendation:

Revise savings estimates for **clothes washers for multi-family units.** We recommend that savings be estimated based on a comparison with a new, standard efficiency model rather than the current practice of comparing the high efficiency model with the existing equipment. A placeholder savings value was recommended for 2007 until research into a new value can be completed.

Enbridge Response:

Enbridge has added this item to the list of 2008 research priorities. Research will be prioritized relative to the other items on the list.

2008 Status: Enbridge investigated savings for multi-residential clothes washers but did not have results available for the 2008 Assumption Update. The Board approved continued use of the original assumption of 342m^3 savings for 2008. Enbridge submitted a revised savings value in the 2009 Assumption Update.

Implemented

29. Recommendation:

Conduct research on effectiveness of **EnerGuide and ENERGY STAR new home** construction rebates. It seems unlikely that these rebates are having any affect on the new construction market. Research demonstrating the incremental benefits of these rebates on builder behavior should be conducted for future program years.

Enbridge Response:

Enbridge will discuss this recommendation on reviewing the list of research priorities with the 2008 EAC.

2008 Status: The EnerGuide for New Homes program was discontinued in 2008. Enbridge has not, as yet, discussed research re: the effectiveness of builder rebates with the EAC.

Follow-up needed

30. Recommendation:

Adopt recommendations provided in the 3rd party engineering review studies. Each of the engineering studies provided a list of recommendations for future evaluation work. The audit supports each of the recommendations made by the engineers regarding future evaluation activities and encourages Enbridge to adopt them as soon as possible.

Enbridge Response:

Enbridge will discuss the research recommendations from the Engineering Review studies with the 2008 EAC. Research priorities in each year have to be set in relation to a review of the full list.

2008 Status: Enbridge is systematically reviewing the recommendations from the 3rd party engineering review studies with the internal DSM engineering committee prior to discussing the recommendations with the EAC.

In Progress

B. EAC Recommendations

31. Recommendation:

Develop research to substantiate prescriptive savings of Novitherm panels in the residential sector for application to 2008 results.

Enbridge Response:

Enbridge has undertaken load research on Novitherm panel installations in the residential sector and will bring forward the study results to the 2008 EAC.

2008 Status: Enbridge circulated the study results to 2008 EAC members in the fall of 2008. The results were submitted in the 2008 Assumption Update and subsequently approved by the Board.

Resolved

32. Recommendation:

For Low Income Weatherization Program, develop approach to savings calculation and evaluation for 2008 following discussion with program manager re: program delivery.

Enbridge Response:

Enbridge will consider with input from the 2008 EAC regarding the 2008 savings calculation and evaluation.

2008 Status: Enbridge has not, as yet, discussed this issue with the EAC. In the 2009 Assumption Update Enbridge submitted revised prescriptive savings and incremental costs per participant based on two years of program results.

Follow-up needed

33. Recommendation:

For greater transparency, report TAPS showerhead and aerator savings separately.

Enbridge Response:

Enbridge will revise TAPS reporting method to separate showerhead and aerator results in 2008 DSM Annual Report.

2008 Status: This recommendation was implemented in 2008 tracking and is reflected in the 2008 Annual Report.

Implemented

34. Recommendation:

In 2008 Energy Star for New Homes, separate results into two groups. For homes where permits were issued under the old building code, apply the prescriptive savings values as approved for 2007. Bring forward new program assumptions for the savings values for Energy Star Homes constructed under the new code.

Enbridge Response:

Enbridge will bring forward new program assumptions for Energy Star Homes constructed under the new code.

2008 Status: In the 2008 Assumption Update, Enbridge submitted program assumptions to be used under the current Ontario Building Code and these were approved by the Board. In the 2009 Assumption Update, Enbridge submitted an additional set of program assumptions for Energy Star Homes constructed under the new code.

Implemented

35. Recommendation:

Put all program assumptions included in Phase III of the Generic Proceeding at the top of the priority list for review and research.

Enbridge Response:

Enbridge will review the 2008 evaluation research priorities with the 2008 EAC following completion of the 2007 audit. These items will be added to the list. Research priorities in each year have to be set in relation to a review of the full list.

2008 Status: Late in 2008 the Board announced the process for approval of assumptions for 2010 and beyond; this process addressed the above recommendation. The Board engaged a consultant (Navigant Consulting) to develop updated assumptions for all measures. This included all measures approved in Phase III of the Generic Proceeding.

Resolved

36. Recommendation:

The TAPS Follow-up Study should clearly indicate whether one or both aerators were installed.

Enbridge Response:

Enbridge will review the survey for the TAPS Follow-up Study and revise as appropriate to address this issue.

2008 Status: The TAPS Follow-up Study was revised in 2008 to capture more detailed information on the number of kitchen and bathroom aerators installed.

Implemented

37. Recommendation:

Enbridge should refer the issue of a change in Steam Trap Measure life to the 2008 EAC for review.

Enbridge Response:

Enbridge has circulated the background study on Steam Trap Measure life to the 2008 EAC for comment.

2008 Status: Enbridge received some comments from the EAC on the Steam Trap Measure life study. The updated measure life value was approved by the Board as part of the 2008 Assumption Update.

Resolved

38. Recommendation:

Bring the issue of spillover and net to gross calculation to the DSM Consultative for policy discussion.

Enbridge Response:

Enbridge will arrange for a discussion of spillover at the DSM Consultative.

2008 Status: Enbridge submitted net to gross values (including spillover) for custom projects in the 2008 Assumption Update. Enbridge's proposed updates were circulated to the Consultative by the Board for comment. Enbridge has not, as yet, included spillover as an agenda item at a Consultative meeting.

Follow-up needed

Appendix C: Questions and Responses

Date	Question	Response	Response Date
4/20/2009	Can you tell me where the backup for the Reduction Factor in the TRC/SSM spreadsheet is? I was expecting it to be in the verification reports but I'm not finding it (or not recognizing it). The reduction factor tab divides a net savings number by a gross savings adjusted for free-ridership number to derive the reduction factor, but I don't see where the net and gross savings numbers come from in the reduction factor tab.	The reduction factors in the reduction factor tab were calculated to ensure gas savings in the actuals tab match what is in DARTS. The reduction factors are calculated using raw data gathered from the TAPs surveys. The attached spreadsheet presents findings from the surveys and calculates the weighted average reduction factor for different measures.	4/21/2009
4/20/2009	I'm having trouble finding the source for the savings estimates and free-ridership for the multi-residential showerheads. Can you point me in the right direction?	The multi-residential showerhead program is a prescriptive program. For source information, you can look at the 2008 OEB approved assumptions. Within our submission are sub-documents that present our source and back-up data.	4/21/2009

Date	Question	Response	Response Date
4/20/2009	The Genivar report calculates separate adjustment factors for industrial and agricultural savings. Can you tell me why the industrial factor is being applied to the agricultural savings in the SSM/TRC spreadsheet?	When Summit Blue was asked to develop a sampling methodology, they saw HVAC technology in the agricultural projects and recommended agricultural projects be placed in the commercial sector sample design. Summit Blue then developed a sampling methodology for the commercial sector that included agricultural projects. Historically, agricultural projects have been included in the industrial sector because the organizations/companies that run agricultural operations, do so to produce agricultural products—producing product is an industrial endeavor. Summit Blue identified three agricultural projects that needed to be verified as part of their recommended sample for the commercial sector. As we have historically placed agricultural projects in the Industrial sector, we asked Genivar to verify the results of the three agricultural projects identified by Summit Blue. Once the verification work was completed by Genivar, a question was raised, where do we put the results of the verification study on the three agricultural projects? Due to time constraints, we did not put the results from the three agricultural projects back into the commercial sample. You may choose to explore this 'glitch' in your audit of our 2008 DSM results. Perhaps we need to put the verification results of the three agricultural projects back into the matrix of commercial projects to be true to the original sample design recommended by Summit Blue, and apply the resulting commercial adjustment factor to both commercial and agricultural projects. This would allow us to be true to the original sample design methodology recommended by Summit Blue.	4/21/2009
4/22/2009	I cannot find any backup for the deemed savings for the multifamily showerheads. I see that the rental deemed savings is listed on the OEB-approved summary sheet, but I have not found where that value comes from. I cannot find the value for the condo savings either on the summary sheet or in the backup sheets.	The 2008 savings assumptions were approved during the 2006 ADR Agreement (see attached document). Showerhead condo savings were adjusted to 94.3 m3 per suite, due to the 2008 GFK Study that determined there were 1.22 showerheads per suite in the Multi-Res.Condo sector. 115 m3 / 1.22 = 94.3 m3 30,966 L / 1.22 = 25,382 L	4/23/2009
4/22/2009	Also, it looks like you uploaded a PowerPoint presentation of the installation rates for Novitherm, but I don't see any savings calculations in the PowerPoint. Item 31 of the 2007 audit recommendations indicates that there was a 2008 study that concluded that the panels saved 4.1%. Do you have that study?	Savings study provided.	4/23/2009

Date	Question	Response	Response Date
4/22/2009	Marco, the 2007 audit recommendations document indicates that the showerhead study was completed this year (Item 22). Do you have that report (it looks like you have uploaded the project description, terms of reference and some interim analysis so far)?	Current study provided.	
4/23/2009	Can you provide documentation for your decision to use the sector-specific free-ridership estimates for C&I projects?	It was settled with the EAC to use sector-specific results. I have asked Judith Ramsay to provide meeting minutes that recorded the EAC recommending the use of sector specific results. Also, please note the OEB approved the use of sector-specific free-ride-ship results for 2008.	4/27/2009
5/4/2009	BII and Genivar Final Report	Delivered.	5/4/2009
5/4/2009	Overview of how participant data are tracked from the time of participation through to the production of the annual report and what kind of controls are in place to assure its accuracy.	Discussed at Enbridge offices.	5/5/2009
5/5/2009	How are homes designated as ENERGY STAR?	1. The builder registers addresses it wants to have ENERGY STAR labeled to a company called Enerquality. Enerquality is a service organization appointed by NRCAN. 2. The builder hires an evaluator to conduct the inspection/audit of the registered addresses to confirm the homes meet ENERGY STAR standards. 3. The evaluator sends its survey/inspection reports to both NRCAN and Enerquality. 4. Enerquality issues the ENERGY STAR label to home addresses that pass the evaluators inspection. 5. Enerquality sends Enbridge monthly summary reports of all addresses that received an ENERGY STAR label. 6. In 2008, Enbridge matched the invoice from the builders to the addresses in the monthly reports. Incentive amounts were paid only for addresses found on monthly reports from Enerquality. 7. Monthly reports from Enerquality are stored and used to track participation and paid-out incentive amounts.	5/6/2009

Date	Question	Response	Response Date
5/8/2009	Do you know how much it costs the builder to hire the evaluator?	This varies, depending on the volume of homes and which company they are using. The average cost ranges from $300–$600. We have considered this to be a marketing expense as a builder needs to do this in order for him to advertise the house as an ENERGY STAR home. It is possible to buy two different homes from two different builders that both meet ENERGY STAR guidelines, yet one has been labeled and one has not. Also, some contractors use the services of Certified Energy Evaluators (evaluator) to help them better design their homes. One example of a better design is an evaluator consulting on the design that requires less timber and meets ENERGY STAR requirements. In this case, the consulting efforts of the evaluator reduced the material cost of the home.	5/14/2009
5/8/2009	Regarding the report, can you tell me what the ESNH and EGNH column titles indicate? Also, what is the distinction between enrollments and labels?	ESNH indicates ENERGY STAR for New Homes, EGNH indicates EnerGuide for New Homes but now is called EnerGuide Rating System. Enrollments are the homes that have sighed up to become ENERGY STAR or EnerGuide, and Labels are the home has been finalized and received the ESNH Label.	5/14/2009
5/13/2009	How does EGD decide whether a boiler is a simple replacement or advancement? What criteria are used?	If the owner or operator of a building indicates a piece of equipment is scheduled for replacement or for removal, the EMC decides the project is a replacement. If the owner or operator of the building indicates the piece of equipment is functioning, and there is no plan to replace or remove it, the EMC decides the project is an advancement. Most building owners prefer to repair an existing boiler because a repair is tax deductible (it is an expense, not a capital investment), requires a lower cash outlay, and is relatively immediate compared to an equipment replacement.	5/20/2009
5/13/2009	How is the base case for an advancement presented? Is it the same for all advancements? Is it tailored to the specific site? How?		

Date	Question	Response	Response Date
5/13/2009	On another related topic: I was struck by what was said at the eTools demonstration regarding ease of use. It seems counter to the EGD position that the process is too complex for the schools sector. Can you explain?	Although eTools is quick to use once the user has been trained and run through a number of examples, this ease of use did not enter into the decision to develop a prescriptive schools boiler program. The primary purpose of the prescriptive schools program was to reduce the administration typically required for custom programs. When the program was being developed, it was observed many schools had similar gas consumption profiles and used boilers of similar efficiency. These similarities suggested the process could be streamlined. By taking advantage of the similarities, a prescriptive program was developed that streamlined the process for the schools and for Enbridge. Not only does this reduce the time required to run E-Tools, but it saves substantial time trying to obtain incremental costs on a case-by-case basis for boilers, which are typically not an individual line item when a school awards a large tender.	5/20/2009
5/15/2009	Are Novitherm values number of participants or number of panels?	Number of participants.	5/19/2009
5/15/2009	Are avoided costs approved by OEB?	Tab 9 of the OEB approved three-year plan outlines the methodology for establishing avoided costs. Enbridge has been following the approved methodology. Also, 2008 avoided costs where filed with the 2007 Audit Summary Report in the Application for Clearance of Accounts (Filed: 2008-08-14, EB-2008-0271, Exhibit B, Tab 5, Schedule 1, Page 19 of 21).	5/19/2009
5/15/2009	The note below Table 2 on page 7 of the Annual Report indicates that the term "participant" in Table 2 refers to the number of measures rather than the number of households. Can you confirm that this is the case?	In 2008 we assumed one device per household in our TRC calculations. Participants in Table 2 truly represent the number of households, and, because we assumed one device per household, participants also presents number of devices. [Cadmus note: Enbridge later provided the TAPS summary information that indicated that the number of installed showerheads was 1.27 per household which is consistent with the deemed savings estimate.]	5/20/2009
5/15/2009	The savings in the TRC calculator for the TAPS showerhead measures appears to be the "per household" savings as calculated by the Summit Blue report, for example 68 cubic meters for "showerheads over 2.5". Is that correct?	The savings in the TRC calculator for the TAPS showerhead measures appears to be the "per household" savings, as calculated by the Summit Blue report; for example, 68 cubic meters for "showerheads over 2.5." Is that correct?	5/20/2009

Date	Question	Response	Response Date
5/15/2009	The savings in the TRC calculator for TAPS showerhead measures is based on installing a 1.25 gpm showerhead. Can you confirm that all of the 2008 showerheads were 1.25 gpm?	Yes, this is correct. Keep in mind that in 2008, we assumed one device per household; so using per household savings is appropriate when estimating savings. [Cadmus note: Enbridge later provided the TAPS summary information that indicated that the number of installed showerheads was 1.27 per household which is consistent with the deemed savings estimate.]	
5/18/2009	Is 150% a cap on market transformation metrics?	No.	5/19/2009
5/18/2009	Are there program costs beyond the costs included in the TRC spreadsheet?	No. Regarding the Energuide for new homes program, if you look at the comments attached to cells AB25 & AC25 (highlighted in green) on tab Actuals of the TRC spreadsheet, you will find an explanation of how the incentive payments where handled.	5/19/2009
5/18/2009	It appears that the total incremental costs are calculated based on the gross number of participants, i.e. before the reduction factor is applied, so I believe that all measure costs whether installed or not have been included. Can you confirm this?	Confirmed. Please refer to Section 8 of the 2007 Audit Recommendation Status summary. Enbridge followed this recommendation in our 2008 programs and results.	5/19/2009
5/18/2009	2) Project S.BM.CM.HOS.016.08 is a steam trap replacement. Can you find out why 15 years was used as the measure life?	Please refer to the attached document (Custom Resource Acquisition Programs, Measure Life Assumptions October 31, 2008). Fifteen years was pulled from this chart under industrial heat recovery. (BKH-Note: BII report indicates pump trap replacement, BII detail indicates steam trap replacement.)	5/20/2009
5/18/2009	3) Project S.BM.CM.SCH.002.08 is also a replacement of boilers. Can you find out why 11 years was used as the measure life?	This project is an advancement. As in question #1, we use 11 years in advancement scenarios.	5/20/2009
5/18/2009	4) Projects S.BM.CM.SCH.007.08 through S.BM.CM.SCH.012.08 are also replacement of boilers. Can you find out why 25 years was used as the measure life and how these differ from the replacement of boiler projects where 11 years was used?	Twenty-five years was pulled from the approved list (see attached document); 25 years was pulled from the boiler line items found in the attached chart.	5/20/2009
5/18/2009	5) Project S.BM.CM.SCH.016.08 is also a replacement of boilers. Can you find out why 11 years was used as the measure life?	This is an advancement. Same as in question 1.	5/20/2009

Date	Question	Response	Response Date
5/18/2009	6) Project S.BM.CM.NC.034.08 is described as "High Efficiency Improvements." A 25 year measure life was used in the TRC spreadsheet. Can you confirm that these were shell improvements? Also, the project file indicates that the incentive was not paid because the customer did not agree to the terms of the EEP. Can you explain what this means and why the project is included in the TRC calculations?	Answer Part 1: Bell Creekbank was an Archetype Calculated project, where the savings were recalculated using the revised A.C. from BII. The project had a measure life of 25 years since it had both shell and HVAC improvements. Answer Part 2: These projects typically have two incentives: one as part of the Design Advisory Program, the second for installation/ implementation. A payment was made for the modeling included in the DAP program. In the agreement for the installation/implementation incentive, EGD asks for access into the building for 18 months. The customer did not agree to this condition, and, as a result, the contract was not signed. EGD was prepared to sign and pay out the incentive if the customer had agreed to all conditions in the contact.	5/27/2009
5/18/2009	7) Project S.BM.IND.ALL.052.08 is an upgrade of an electric furnace. I did not find an approved measure life for electric furnaces. Can you tell me the source of the 18 year measure life?	Please refer to the attached document; 18 years comes from Industrial Equipment, Furnaces (gas-fired). We assumed the same life for an electric furnace.	5/20/2009
5/18/2009	1) Project S.BM.CM.HOS.001.08 is a replacement of boilers. Can you find out why 11 years was used as the measure life?	This project is an advancement. Through previous audits and agreements with the EAC, we have reached agreement to use 11 years in advancement scenarios.	5/20/2009
5/20/2009	Does the EGD note the age of the existing boiler?	We do not collect the age of the boiler as that is not always available and not critical for savings calculations.	5/27/2009
5/27/2009	Project S.BM.CM.NC.038.08 also appears to have HVAC equipment. The measure life assumption for HVAC equipment appears to be 15 years. Do you know the proportion of savings attributable to the shell versus HVAC equipment for these projects? If it is typical that the new construction projects have a mix of HVAC and shell improvements, has the Company considered a weighted measure life?	Historically, for new construction custom projects, we have taken the measure life of shell improvements. We have looked into the application of different measure lives, such as a weighted approach, but have found it difficult to develop a methodology that is acceptable. The table below presents possible values for savings and incremental costs under different scenarios. Challenges with an average weighted approach include the following: 1. How do we best generate all these numbers? 2. How do we use these numbers to generate a weighted average measure life? Is the weighted average based on savings? Based on incremental cost?	5/27/2009

Date	Question	Response	Response Date
5/27/2009	I'm going under the assumption that the new construction projects consist of some combination of shell measures, HVAC, lighting, controls and other energy efficient technologies. Does Archetype model the building with and without these enhancements to create a total savings for the project? If so, does it calculate the savings by measure?	The Archetype calculator was developed because the federal government (NRCAN) was no longer supporting the EE4 calculator, which is the base calculator to determine the savings from base case to high-efficiency case. The EE4 calculator was generating a base case based on the 1998 MNECB (Model National Energy Code of Canada for Buildings); however, when the OBC (Ontario Building Code) was updated in 2006, the EE4 Calculator was not updated. Therefore, the Archetype calculator was developed to adjust the results of the EE4 calculator for the new updated OBC 2006 requirements. It does so in the following measure buckets: • Lighting • Auxiliary Equipment • Space Heating • Space Cooling • Heat Rejection • Pumps and Miscellaneous • Vent Fans • Water Heating • Refrigeration Savings for each bucket are generated. In 2009, Enbridge will no longer be using the Archetype calculator. Base cases will be developed based on the current OBC, not the EE4 calculator.	5/28/2009

CCC INTERROGATORY #4

INTERROGATORY

Ref: Ex. B/T1/S4

With respect to the Home Performance Contractors Market Transformation Program please indicate how EGD will measure the extent to which the market for weatherization measure is “transformed”.

RESPONSE

The level of interest in the workshops indicates that there is an on-going market need for this type of training and education. The participant survey outlined at Exhibit B, Tab 1, Schedule 4, pages 2 to 3 offers additional insight into the level of need in the market by the results of the "baseline frequency" measure. As these baseline levels of weatherization practices grow, Enbridge will assess the point at which additional workshops will offer diminishing returns and consider the market transformed.

Witnesses: M. Brophy
P.Squires

CCC INTERROGATORY #5

INTERROGATORY

Ref: Ex. B/T1/S4

With respect to the Home Performance Contractors Market Transformation Program how will EGD assess the extent to which the uptake of weatherization measures is attributable to other programs offered by the Federal Government, the Provincial Government and other service providers?

RESPONSE

The ultimate outcomes metric for this program (i.e. average increase in weatherization measures) is based on a very specific list of eight measures that are explicitly covered in the workshop curriculum, and the follow-up survey informs the respondents that the questions relate to the Enbridge workshop components.

Witnesses: M. Brophy
P.Squires

CCC INTERROGATORY #6

INTERROGATORY

Ref: Ex. B/T1/S4

With respect to the Home Performance Contractors Market Transformation Program please explain how the market effects numbers were derived.

RESPONSE

Market effect numbers were derived based on an assessment of historical program results, based on an apple to apples comparison.

A program improvement was made for 2010 where respondents will be matched and only those who complete both the pre and the follow up surveys will be included in the results.

Witnesses: M. Brophy
P. Squires

CCC INTERROGATORY #7

INTERROGATORY

Ref: Ex. B/T1/S4

With respect to the Drainwater Heat Recovery System Market Transformation program what are the cost of the units? How was the $400 incentive derived? Please provide the results to date of the 2009 program. Please explain why EGD should get a reward for the number of builders enrolled in the program if it does not mean they are actually installing the units in homes.

RESPONSE

The cost of the units that the manufacturer Renewability is charging is $400, and Enbridge's incentive is intended to offset 100% of the costs.

The program has yet to be launched in 2009 and therefore there are no results to report at this time.

Enbridge is targeting both units installed and builders enrolled to reflect the joint goals of maximizing energy savings and maximizing the number of builders that have been introduced to this technology. Note that "builders enrolled" must be installing some units in their homes.

Witnesses: M. Brophy
P. Squires

CCC INTERROGATORY #8

INTERROGATORY

Ref: Ex. B/T1/S4/p. 7

With respect to the Drainwater Heat Recovery System Market Transformation program please explain, in detail, why EGD should get an SSM reward for simply attending trade shows, when in fact there may be no evidence as to "market transformation". With respect to workshops please explain why EGD's shareholders should get rewarded for simply holding the workshops when in fact there may be no evidence of "market transformation."

RESPONSE

These program elements are supporting activities to ensure that builders are properly introduced to, and informed about the technology and its benefits, to properly promote its benefits to the home buyer. Workshop and tradeshow participation ensure that builders are discussing this technology with their peers and sharing best practices, which will encourage more rapid and successful adoption of the technology. The relatively low weightings on these program metrics reflect their supporting role in the achievement of the more significant "ultimate outcomes" metrics in the scorecard.

Witnesses: M. Brophy
P. Squires

CCC INTERROGATORY #9

INTERROGATORY

Ref: Ex. B/T1/S4/p. 7

With respect to the Drainwater Heat Recovery System Market Transformation program how did EGD decide that its shareholders should receive $350,000 if all of the scorecard targets are met? Why not $50,000 or $100,000?

RESPONSE

Relative to the 2010 Home Performance Contractor Market Transformation program, and relative to other MT programs, the Drainwater Heat Recovery program is expected to have a broad reach across the Enbridge franchise and result in large direct energy savings impacts, and as a result should receives a proportionately larger shareholder incentive. In EB-2006-0021, Phase 3, the Board approved a shareholder incentive of $500,000 for a similar program, but based on the mix of programs proposed by Enbridge, only $350,000 has been targeted for this program.

Witnesses: M. Brophy
P. Squires

CCC INTERROGATORY #10

INTERROGATORY

Ref: Ex. B/T1

For each year since the SSM was developed please provide EGD's TRC target, actual TRC and SSM pay-out for each year. Please include the market transformation program results as well.

RESPONSE

Please see chart below.

	Year	TRC budget ($Million)	Actual TRC ($Million)	SSM ($Million)	Market Transformation SSM	Total incentive ($Million)
1	1999	$43.3	$57.1	$4.9	N/A	$4.8
2	2000	$55.9	$74.6	$3.5	N/A	$3.5
3	2001	$133.4	$166.3	$4.6	N/A	$4.6
4	2002	$138.5	$147.5	$1.8	N/A	$1.8
5	2003	$110.6	$125.9	$2.6	N/A	$2.6
6	2004	$175.8	$155.3	$0.0	N/A	$0.0
7	2005*	$201.5	$196.1	$0.0	N/A	$0.0
8	2006	$148.1	$180.7	$10.9	$300,000	$11.2
9	2007	$150.0	$199.8	$8.1	$178,151	$8.2
10	2008	$168.3	$182.7	$5.6	$318,825	$5.9

*2005 = 15 months due to change in year end

Witnesses: M. Brophy
P. Squires

4 - CME

CME INTERROGATORY #1

INTERROGATORY

At Exhibit B, Tab 1, Schedule 1, page 2 of 3, EGD states that its 2010 DSM Plan is presented using the DSM framework approved in EB-2006-0021. EGD also confirms that the DSM budget for 2010 produced by the EB-2006-0021 formula is $23.8M. CME would like further information about the Total Resource Cost ("TRC") target and Shared Savings Mechanism ("SSM") incentive produced by the EB-2006-0021 formula. Please provide:

(a) EGD's TRC target for 2010;

(b) The SSM incentive payment for which EGD will be eligible if it achieves 100% of its TRC target; and

(c) The maximum SSM incentive payment available to EGD for 2010.

RESPONSE

(a) Enbridge's 2010 TRC target will not be available until the 2009 DSM audit is complete in 2010. EGD intends to apply the formula approved in the EB-2006-0021 Board Decision.

(b) The SSM incentive payment for which EGD will be eligible if it achieves 100% of its TRC target is $4.75 Million

(c) The maximum incentive for 2010 will be calculated in the last quarter of 2009 as described on page 28 of the EB-2006-0021, Decisions with Reasons.

> "The parties agree that the annual 'cap' of $8.5 million will increase annually by the Ontario CPI as determined in October of the preceding year (i.e., the 2008 cap will increase based on CPI as determined at October of 2007).

Witnesses: M. Brophy
P. Squires

CME INTERROGATORY #2

INTERROGATORY

Please confirm that EGD will continue to apply the rules applicable to the Lost Revenue Adjustment Mechanism ("LRAM") established in EB-2006-0021.

RESPONSE

EGD intends to continue to apply the rules applicable to the Lost Revenue Adjustment Mechanism established in EB-2006-0021.

Witnesses: M. Brophy
P. Squires

CME INTERROGATORY #3

INTERROGATORY

Please confirm that EGD will continue to apply the rules applicable to DSM Variance Account ("DSMVA") established in EB-2006-0021.

RESPONSE

EGD intends to continue to apply the rules applicable to DSM Variance Account established in EB-2006-0021.

Witnesses: M. Brophy
P. Squires

CME INTERROGATORY #4

INTERROGATORY

CME wishes to better understand the historic development of EGD's DSM budget, TRC target, SSM, LRAM and DSMVA. To assist in this matter, please prepare a table that sets out for each of the years 2006 to 2009, the following information:

(a) The DSM budget;
(b) The actual DSM expenditures;
(c) The TRC target;
(d) The m^3 of natural gas savings achieved;
(e) The TRC net benefits achieved;
(f) The SSM incentive payment;
(g) The LRAM payment; and
(h) The variance recorded in the DSMVA.

RESPONSE

In response to a0 to h) above, please see table below.

		2006		2007		2008*		2009
1	DSM Budget ($Million)	$18.9		$22.0		$23.1		$24.3
2								
3	Actual DSM O&M ($Million)	$19.3		$21.4		$23.0		N/A
4								
5	DSMVA	$374,753		$616,135		$73,340		N/A
6								
7	TRC Budget ($Million)	$148.0		$150.0		$168.3		N/A
8								
9	TRC Actual ($Million)	$180.7		$199.8		$182.7		N/A
10								
11	Actual m3 (million)***	89.5		91.9		80.3		N/A
12								
13	SSM ($Million)**	$11.2		$8.2		$5.9		N/A
14								
15	LRAM	$339,524		$301,289		$37,291		N/A

*based on 2008 auditor recommendation
** Includes Market transformation incentive
*** FE m3 volumes reflective of SSM Scenario

Witnesses: M. Brophy
P. Squires

CME INTERROGATORY #5

INTERROGATORY

Exhibit B, Tab 1, Schedule 2, page 1 of 1, is a table that summarizes EGD's 2010 DSM budget by market segment. In order to permit CME to better understand the potential impact which the 2010 DSM budget will have on its members, please:

(a) Provide a summary of how EGD's DSM costs are allocated to each rate class;
(b) Based on Table 1 of Exhibit B, Tab 1, Schedule 2, page 1 of 1, provide an estimate of the allocation of the 2010 DSM budget by rate class.

RESPONSE

(a) Cost allocation in rates is on the same basis as budgeted DSM spending by customer class. This allocation applies to both direct and indirect DSM program costs.

b) Please see the response below and the chart on the following page.

Residential
Items 2+3+4+5+16 = $8,611,131 (allocated entirely to Rate 1)

Small Commercial
Item 8 = $840,200 (allocated entirely to Rate 6)

Commercial
Items 9+11 = $2,821,912

Multi-Residential
Item 10 = $2,022,292

Industrial
Items 12+13+22 = $4,555,235

Portfolio Administration
Item 19 = $6,200,000 (allocated based on the 2010 direct costs rate allocation)

Witnesses: M. Brophy
P. Squires

2010 DSM O&M Allocation by Rate Class	
Rate 1	$10,171,956
Rate 6	$9,364,966
Rate 100	$0
Rate 110	$937,495
Rate 115	$1,822,081
Rate 135	$114,828
Rate 145	$570,251
Rate 170	$2,069,195
Grand Total	**$25,050,770**

Witnesses: M. Brophy
P. Squires

CME INTERROGATORY #6

INTERROGATORY

CME wishes to better understand the impact which EGD's DSM budgets and SSM incentive payouts have on particular rate classes. For the years 2006 to 2009, please provide a table that sets out the allocation of EGD's annual DSM budgets and SSM payments by rate class.

RESPONSE

Below please find a table that sets out the allocation of EGD's annual DSM budgets and SSM payment by rate class.

	2006		2007	
	Budget O&M	**SSM Payment***	**Budget O&M**	**SSM Payment***
Rate 1	$10,425,406	$4,579,926	$10,127,860	$3,301,323
Rate 6	$2,316,407	$1,929,868	$2,256,609	$1,169,063
Rate 100	$3,442,652	$2,566,265	$4,275,875	$2,067,611
Rate 110	$909,161	$560,959	$1,064,322	$910,155
Rate 115	$1,313,283	$381,107	$1,110,606	$339,207
Rate 135	$0	$26,859	$0	$25,794
Rate 145	$714,627	$669,843	$993,578	$205,353
Rate 170	$1,275,438	$514,249	$2,171,150	$229,540
Total	$20,396,974	$11,229,076	$22,000,000	$8,248,046

	2008		2009	
	Budget O&M	**SSM Payment***	**Budget O&M**	**SSM Payment***
Rate 1	$11,212,959		$11,374,755	
Rate 6	$5,849,013		$9,003,974	
Rate 100	$2,321,870		$0	
Rate 110	$599,649		$661,673	
Rate 115	$1,146,567		$1,226,645	
Rate 135	$76,438		$62,082	
Rate 145	$514,219		$510,306	
Rate 170	$1,379,285		$1,415,565	
Total	$23,100,000	NA	$24,255,000	NA

Note: * As per Clearance of Accounts

Witnesses: M. Brophy
P.Squires

CME INTERROGATORY #7

INTERROGATORY

At Exhibit B, Tab 1, Schedule 3, EGD describes its 2010 DSM Monitoring and Evaluation Plan. Please confirm that EGD will maintain an Evaluation and Audit Committee for its 2010 DSM audit.

RESPONSE

Enbridge intends to maintain an Evaluation and Audit Committee for 2010.

Witnesses: M. Brophy
P. Squires

CME INTERROGATORY #8

INTERROGATORY

At Exhibit B, Tab 1, Schedule 3, EGD describes its 2010 DSM Monitoring and Evaluation Plan. CME wishes to better understand the impact that the evaluation and audit process has had on the SSM and LRAM. Please provide a table that sets out for the years 2006 to 2009 the pre-audit and post-audit amounts claimed by EGD for TRC, SSM and LRAM.

RESPONSE

Below please find a table that sets out for the years 2006 to 2009 the pre-audit and post-audit amounts claimed by EGD for TRC, SSM and LRAM.

	Pre-Audit			Post Audit		
Program Year	TRC $	SSM $	LRAM (m^3)	TRC $	SSM $	LRAM (m^3)
2006	201,168,605	12,522,731	77,427,500	180,666,791	10,929,075	89,520,319
2007	209,218,102	8,500,000	94,254,793	199,798,420	8,248,046	85,069,168
2008	181,769,031	6,001,802	79,782,857	182,706,679	5,926,222	77,252,981
2009	N/A			N/A		

Witnesses: M. Brophy
P.Squires

5 - GEC

GEC INTERROGATORY #1

INTERROGATORY

Ref: Exhibit B, Tab 1, Schedule 4, Pages 2-4 of 8 (Home Performance market transformation scorecard):

A. Please describe how the survey analysis proposed for measuring the ultimate outcome (i.e. average increase in frequency scores of all weatherization measures) addresses questions regarding the validity and statistical significance of the results. What threshold response rate, if any, is set that assures the respondents are representative of all workshop participants? What approach shall be used if responses are below that threshold? Is the Company committed to using both the same survey questions and the same survey strategy regarding recruitment of respondents for the baseline (i.e. 2009) and program year measurements? If not, why not?

B. Please explain the category of contractor engagement. What is the company's definition of engagement? What factors will be measured to ensure that a contractor is "engaged"? How will they be measured? Is the metric the number of contracting firms, or the number of individuals working in contracting firms?

C. Please provide the results to date (in 2009) for the second and third metric.

D. Please describe how the specific targets for each of the three proposed metrics (e.g. 100% targets of 0.45, 70 and 8) were selected.

.

RESPONSE

a) Enbridge aims to reach as many attendees as possible for the follow-up survey. Given the challenges of finding the attendees six months after the workshop, we target a response rate of 50% of registered workshop attendees, which provides a strong representation of all attendees. In 2008, for example, we reached 60% of workshop attendees for the follow-up survey. The same survey will be used to measure the baseline and the program year measurement.

Witnesses: M. Brophy
P. Squires

b) The Employee Engagement metric captures the number of participants who register and complete the training workshop. The metric is based on individuals, not firms.

c) To date in 2009, Enbridge has achieved a level of 50 for the contractor engagement metric through the completion of three workshops.

d) The 100% targets for each of the three performance metrics were established based on previous years' actuals, taking into consideration a planned emphasis on the ultimate outcomes metric in 2010 as well as budget limitations.

GEC INTERROGATORY #2

INTERROGATORY

Ref: Exhibit B, Tab 1, Schedule 4, Pages 5-7 of 8 (Drain Water Heat Recovery market transformation program)

A. Is the focus of this initiative limited to residential new construction (i.e. the units installed metric is limited to units installed in new homes)? Is it all new homes, or a sub-segment (e.g. single family detached) of the market?

B. Approximately how many new homes are built each year in Enbridge's target market for this program?

C. Please provide the results to date (in 2009) for each of the seven proposed metrics.

D. Please describe how the specific targets for each of the three proposed metrics (e.g. 100% targets of 17, 1800, 60%, 70%, 3, 3, and 3) were selected.

E. What is the definition of an enrolled builder? Enbridge's text says something about what it is not, but does not provide a measurable criterion for what it is.

F. Regarding the second metric, units installed, is this the number of units or the number of homes (since some homes could have more than one unit)? If it is number of units, what has been the experience to date and Enbridge's expectation of the future regarding the average number of units per home?

G. Regarding the third metric, builder knowledge, is the Company planning on only measuring knowledge among non-enrolled builders? Has this ever been measured to date by either Enbridge or Union? What was the result of any such measurements? Is the Company committed to using both the same survey questions and the same survey strategy regarding recruitment of respondents for the baseline (i.e. 2009) and program year measurements? If not, why not?

H. Regarding the fourth metric, service provider promotion, what exactly is being measured? Is it the percentage of items on that list that each service provider fulfilled? What is on that list? Also, are there only three service providers (i.e. those listed on page 5)?

Witnesses: M. Brophy
P. Squires

I. Regarding the fifth and sixth metrics, numbers of workshops, please describe these workshops. How long are they typically? Is attendance free for participating builders and subcontractors?

RESPONSE

a) The focus of this program is on residential new home construction and it is available to all home segments.

b) Approximately 21,000 new construction homes are proposed to be built in the Enbridge franchise area in 2010.

c) This program has not launched as of August 6, 2009.

d) The 2009 program metrics were based on industry knowledge, including what has been developed and delivered to market by Union Gas in their DWHR program to date, taking into consideration the relative size of the Enbridge franchise area, number of builders, with consideration that this is a new program for Enbridge.

e) An enrolled builder is a builder who is participating in the program and installing DWHR units.

f) One DWHR unit per home is available. The reason for one unit per home is so that we can influence builders to maximize savings by building the drain water connections cin a cost efficient manner in order that all drain waste goes into one pipe versus going down mutiple pipes (bathroom(s), kitchen and laundry).

g) Builder Knowledge will be measured for non-enrolled builders for the purposes of this metric. As this program has yet to be launched in 2009, Enbridge has not completed a builder knowledge measurement yet. Enbridge is unable to comment on behalf of Union. Enbridge plans to use the same survey approach for measuring the baseline and program year measurements.

h) Enbridge has required that each of the rental providers involved in the program promote the DWHR technology through trade shows, builder binders updates, distribution of Enbridge-created collateral, and promotion of training workshops to builders and their sub-contractors. The metric will be scored based on percentage completion of these promotional activities. Currently there are only three rental providers within our franchise area who offer hot water rental tanks, and are involved in the Enbridge program: Direct Energy, Reliance Home Comfort and National Home Services.

Witnesses: M. Brophy
P. Squires

i) The workshops will be conducted by the rental providers, EnerQuality and Enbridge channel consultants, free of charge to builders and sub contractors. It is estimated that the seminars will be approximately ½ day in length.

GEC INTERROGATORY #3

INTERROGATORY

Ref: Exhibit B, Tab 2, Schedule 1, Page 2 of 47 (Energy Star for New Homes program description),

Please explain any significant ways in which this program is different from the program the Company ran in 2008.

RESPONSE

In 2008 Enbridge supported the Energy Star for new homes version 3. In 2009, the program is based on Version 4 (for permits issued after March 31, 2009).
The difference between the Version 3 and Version 4 assumptions are as follows:

a) Natural Gas Savings decreased from 1018 m^3 (Version 3) to 881 m^3 (Version 4).

b) Electricity decreased from 1450 kWh to 734 kWh.

c) Incremental costs decreased from $4,701.00 in Version 3 to $4,275.00 in Version 4

Witnesses: M. Brophy
P. Squires

GEC INTERROGATORY #4

INTERROGATORY

Ref: Exhibit B, Tab 2 Schedule 1 Page 9 of 47 (Custom Resource acquisition Program: Capital Financing):

A. Who will provide the financing capital? The Company, existing lending institutions or some other entity?

B. Will the financing be "on-bill", in that repayment will be attached to payment of the gas bill (or will it be a separate payment)?

C. Is the Company anticipating using DSM budget funds to buy down the interest rates?

D. Please explain how the relative effectiveness of financing will be evaluated against traditional incentives. Please include any information on the company's historical experience in this area.

RESPONSE

a) This program detail is currently in development.

b) This detail has not yet been determined.

c) Please see response to IGUA Interrogatory #4 at Exhibit I, Tab 6, Schedule 4.

d) The relative effectiveness of financing against traditional incentives will be evaluated on the basis of participation rates between the two program options, and based on overall level of participation in the industrial custom program.

Enbridge has had some limited experience in third party financing as a program offering several years ago in the commercial sector. The current industrial program is intended to respond to the specific operational needs of industrial customers, and is a response to recent focus group feedback from industrial customers who have identified capital financing as a barrier to pursuing energy efficiency projects.

Witnesses: M. Brophy
P. Squires

GEC INTERROGATORY #5

INTERROGATORY

Ref: Exhibit B, Tab 3, Schedule 1, p. 2, paragraph 6,

Please list all measures for which changes in free ridership values (relative to EB-2008-0384) are proposed, showing both the previous assumption and the proposed new assumption.

RESPONSE

Please see the following table.

EFFICIENT EQUIPMENT & TECHNOLOGIES	**2010 (EB-2009-0154)**	**2008 (EB-2008-0384)**
RESIDENTIAL NEW CONSTRUCTION		
Programmable Thermostat (Installed)	43%	Same as existing
RESIDENTIAL EXISTING HOMES		
Enhanced (Furnace only) and HighEfficiency Furnace	100%	82%
COMMERCIAL NEW BUILDING CONSTRUCTION		
Pre-Rinse Spray Nozzle (1.24 GPM)	12.4%	5.0%

Witnesses: M. Brophy
P. Squires

GEC INTERROGATORY #6

INTERROGATORY

Ref: Exhibit B, Tab 3, Schedule 1, p. 3, paragraph 8,

Please list all measures for which changes in incremental costs are being proposed, showing both the previous Navigant assumption and the proposed new Enbridge assumption

RESPONSE

Please see the chart on the following page as well as refer to Exhibit B, Tab 3, Schedule 2 for a complete list that includes color coding.

Witnesses: M. Brophy
P. Squires

Incremental Cost Summary

	NP - No Program	N/A = Not Provided
Efficient Equipment & Technologies	**Enbridge proposed**	**Navigant**
RESIDENTIAL EXISTING HOMES		
Faucet Aerator (kitchen and bathroom, installed, 1.5 GPM)	$1.00	$2.00
Low-Flow Showerhead (Per unit, installed, 1.5 GPM)	$4.00	$6.00
Low-Flow Showerhead (Per unit, installed, 1.25 GPM)	$19.00	$13.00
Reflector Panels	$238.00	$229.00
Programmable Thermostats	$50.00	$25.00
COMMERCIAL NEW BUILDING CONSTRUCTION		
Infrared Heaters	.01222/10^3 BTUH/hr	$0.02
COMMERCIAL EXISTING BUILDINGS		
Infrared Heaters	.01222/10^3 BTUH/hr	$0.02
Low-Flow Showerhead (Per unit, distributed, 1.5 GPM)	$4.00	$6.00
Low-Flow Showerhead (Per unit, installed, 1.25 GPM)	$17.00	$13.00

GEC INTERROGATORY #7

INTERROGATORY

In its discussion of prescriptive boilers (Exhibit B, Tab 3, Schedule 1, p. 4), Enbridge says the measure is for customers "in smaller facilities". What exactly does the Company mean by a smaller facility? Will boilers installed in buildings above a certain size or a certain annual level of gas consumption still be treated as custom measures? If so, what size or usage or other threshold is the Company planning to use to determine what is prescriptive and what is custom? How will it determine when the threshold criterion has been met?

RESPONSE

The Company is planning to limit the Prescriptive Boiler Program to boilers up to 1,500 MBH in installed capacity, not facility size. Boilers above this size will be processed through the Custom Acquisition Program.

Witnesses: M. Brophy
P. Squires

GEC INTERROGATORY #8

INTERROGATORY

Ref: Exhibit B, Tab 3, Schedule 1, pp. 6-7, paragraph 13:

A. Is the Company planning to conduct surveys to determine the extent to which the measures provided are actually installed?

B. Please explain what is meant by the term “Company market knowledge”? Has the Company conducted any surveys on the frequency with which these measures are installed in new homes? Has it conducted any interviews with samples of builders to reach such conclusions?

C. What further information regarding free ridership is the Company planning to gather? How will it be gathered?

RESPONSE

a) Surveys will be conducted by Enbridge Channel Consultants who will visit newly built homes to ensure "energy saving kits" components have been installed.

b) Company market knowledge is based on industry discussions. Resulting best available information is referenced on each measure substantiation sheet in Exhibit B, Tab 3, Schedule 3, pages 9 to 13.

c) Free ridership rates are proposed to be monitored through the assessment of standard builder practices. This may leverage Enbridge Channel Consultant interactions with builders and/or other survey instruments.

Witnesses: M. Brophy
P. Squires

GEC INTERROGATORY #9

INTERROGATORY

Ref: Exhibit B, Tab 3, Schedule 1, p. 7, paragraph 14,

The Company appears to say that it is proposing to use both the gas and electric savings values from the Navigant report. However, this section is titled "Alternative Assumptions". Is the Company proposing to change one of the two assumptions? If so, which assumption is being changed and by how much? If the gas assumption is being changed, please provide a copy of the report related to the billing analysis or any other research that the Company is proposing be the basis for the change.

RESPONSE

The clerical error related to double counting of behavioral based impacts relates to natural gas savings. The values without double counting the adjustment are as outlined in Exhibit B, Tab 3, Schedule 3, page 13.

Witnesses: M. Brophy
P. Squires

GEC INTERROGATORY #10

INTERROGATORY

Ref: Exhibit B, Tab 3, Schedule 3, p. 37, reference to the Agviro report titled "Prescriptive Commercial Boiler Program – Prescriptive Savings Analysis":

A. Was this report ever shared with and reviewed by the EAC? If not, why not?

B. Was the report ever shared with and reviewed by the 2008 Auditor? If not, why not?

C. Please provide a copy of the report.

RESPONSE

a) This program is new for 2010 and based on the third party engineering report referenced. Discussion regarding prescriptive boilers has been conducted with both the EAC and 2008 auditor, but has been largely focused on the prescriptive approach for schools.

b) Please refer to a.

c) Please find the referenced report attached.

Witnesses: M. Brophy
P. Squires

PRESCRIPTIVE COMMERCIAL BOILER PROGRAM

PRESCRIPTIVE SAVINGS ANALYSIS

May 25, 2009

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Introduction

Enbridge Gas Distribution wishes to simplify its programs for commercial businesses by implementing a prescriptive boiler program for the commercial sector.

To date, within the Enbridge franchise area, the commercial sector has been eligible for incentives only under its custom programs. Custom programs require significant supporting documentation to meet regulatory requirement. In many cases it is difficult for the customer to estimate base case costs and incremental costs. This has typically led to delays in application processing times and significant on going communication between the utility and the customer.

A prescriptive program will simplify the application and incentive process and should address this barrier.

The proposed program will offer a fixed incentive dependent on the boiler size category. This report follows several steps in determining the costs and savings of using higher efficiency boiler equipment in the commercial sector.

Analysis

- This section determines the consumption of an average small commercial business using Enbridge's customer database.

Boiler Plant Hourly Input

- This section calculates the size of boiler required to provide heat and hot water for a typical facility, using ASHRAE accepted principles and Enbridge's E-Tools calculator.

Average Boiler MSRP

- This section determines the Manufacturer's Suggested Retail Price, from the utilities' boiler databases for boilers based on determined size.

Savings Analysis

- This section is used to determine all incremental costs and savings versus a base case of 80 to 82% and to calculate the TRC benefits based on the estimated savings and incremental costs.

The report details the analysis and savings for both seasonal (ie., space heating) and non-seasonal (ie., domestic hot water) hot water boilers.

For purposes of this analysis, boilers are categorized in the following combustion efficiency ranges:

- 80-82% [Base Case]
- 83-84 %
- 85-88%
- 89+%

The original savings analysis dated September 10th, 2008 considered boiler sizes of 300, 600, 1000, 1500, and 2000 MBH. This analysis has been expanded to include boiler sizes of 400, 500, 700, 800 and 1200 MBH in addition to the previous sizes. The TRC analysis has also been updated to use 2009 values including using a free-ridership of 12%, a measure life of 25yrs and energy cost projections from 2009 to 2038

Methodology

An iterative approach was used to determine the annual savings in the commercial sector. The following steps were taken:

a. The Rate 6 accounts were subdivided into bins of annual gas use. This provided the annual average gas use, number of accounts, seasonal, non-seasonal and total gas use.
b. The seasonal portion of the annual gas use was normalized to 30 year weather data. This normalized gas use was correlated to a seasonal boiler size required for gas consumption.
c. Categories of boiler sizes were selected to provide a suitable range of boilers available within the sector.
d. The Rate 6 accounts were subdivided using the normalized average seasonal gas use for the respective categories of boilers selected. This provided the annual average gas use, number of accounts, and total gas use per seasonal boiler size category.
e. Seasonal annual gas use normalization of the boiler size category accounts was completed.
f. Annual seasonal efficiency of the boiler size categories for each of the combustion efficiency ranges was determined.
g. Boiler costs for the boiler size categories was compiled.
h. A TRC analysis was completed for each of the boiler size categories.
i. A similar approached was used for the non-seasonal gas use with the exception of normalizing the data.

Commercial Accounts

The Enbridge Rate 6 Accounts were analyzed for 2006 annual gas use. The intent was to review accounts using an annual gas use less than 175,000 m3 which included close to 105,000 accounts. The initial analysis developed a breakdown of the accounts into 10,000 m3 Bins of annual gas use as shown in the table below. A figure of the table is included in Appendix A. Non-seasonal represents the gas use consumption for non-seasonal items such as domestic use, laundry, kitchen, cleaning, etc.. Seasonal represents the gas use on a seasonal basis which would largely be considered for space heating purposes.

Table 1: Annual Gas Use Bins; Rate 6 Accounts

Gas Use Bin (m3)		# of Accounts	2006 Ave (m3)		
Low	High		Non-Seasonal	Seasonal	Total
-	10,000	72,196	595	2,586	3,181
10,000	20,000	13,541	4,230	9,941	14,171
20,000	30,000	6,008	7,752	16,736	24,488
30,000	40,000	3,537	10,059	24,536	34,595
40,000	50,000	2,344	11,736	32,906	44,642
50,000	60,000	1,614	14,786	39,965	54,751
60,000	70,000	1,202	16,804	47,881	64,685
70,000	80,000	899	20,714	54,041	74,755
80,000	90,000	681	23,406	61,458	84,864
90,000	100,000	520	23,890	71,122	95,012
100,000	110,000	452	30,216	74,699	104,915
110,000	120,000	359	32,999	81,887	114,886
120,000	130,000	271	35,541	89,427	124,968
130,000	140,000	261	39,471	95,515	134,986
140,000	150,000	224	38,202	106,842	145,044
150,000	160,000	187	40,322	114,563	154,885
160,000	170,000	178	48,046	116,772	164,818
170,000	180,000	168	46,820	127,874	174,694

The non-seasonal consumption was determined by taking the gas use during June, July and August as a base-line for the entire year.

Seasonal Gas Use

Boiler Plant Sizing Analysis

An analysis was done for the accounts in each of the Gas Use Bins to determine the boiler size required to consume the seasonal annual gas use. Several steps were involved during this process. For simplicity and brevity, sample calculations and values are included for the 10,000 to 20,000 m3 Gas Use Bin. Identical steps were used for the other Gas Use Bins.

1. **Average Monthly Data**
   The average monthly data for the respective Bin was harvested from the Rate 6 accounts. The table below shows the data for the 10,000 to 20,000 Bin. Appendix A shows values for all Bins.

Table 2: Monthly Gas Use; 10-20,000 Bin

2006 Monthly Average (m3)												2006 Annual Ave (m3)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2,467	2,116	2,355	1,353	747	462	362	352	352	654	1,366	1,585	14,171

2. **Normalization**
   Normalization was done using Commercial ETools V1.07. The Normalization Tool compares the Heating Degree Days of the 2006 year weather versus 30 year normal weather HDDs and adjusts the gas use to better reflect a normal year. The Normalization Tool also determines the Seasonal versus Non-Seasonal gas use for the selected time period. The normalized load for the 10-20,000 Bin is 12,041 and 4,230 m3 for the seasonal and non-seasonal loads respectively for a total of 16,271 m3. The values for all Bins are included in Appendix A.

3. **Boiler Selection Tool / Existing System**: When using a lead-lag type system, the existing boiler system is assumed to be the lag system and the lead system is specified as such. The lead analysis uses a combination of Bin temperature numbers and seasonal efficiency to determine when the lead system has reached 100% capacity and the lag system must be used. Inputs for the existing system are shown in the Boiler Selection Tool printout in Appendix B.

   The seasonal efficiency values used are shown in the Seasonal Efficiency printout in Appendix B. These values determined a seasonal efficiency of 53.76 for the selected system.

4. **Boiler Selection Tool / Lead-Lag System**: The lead boiler input size was manually adjusted to provide a Lead Portion of 100%. An input value of 140 MBH resulted in a Lead Portion of 100.0%. This is the minimum boiler capacity required to have an annual consumption of 12,041 m3. Printouts for the Boiler Selection and Lead-Lag analysis are included in Appendix B.

5. **Correlation of Bin Consumption vs. Boiler Size**: The boiler size determined from the Boiler Selection Tool / Lead-Lag System is the minimum boiler capacity and not necessarily the boiler size installed. An oversize factor of 20 to 25% is common for nonresidential heating system design (ASHRAE Fundamentals, 30.29). Using an oversize value of 25% would require a

boiler size of 175 MBH. A figure of boiler size correlation versus normalized seasonal gas use in included in Appendix B. This correlation provided the following linear trendline equation.

Equation 1: Seasonal Boiler Size Equation

$$y = 0.0144x + 6.3764$$

where:

y = seasonal boiler size (MBH) [including a 25% oversize factor]
x = normalized annual seasonal gas use (m3/yr)

Boiler Size Categories

Ten boiler size categories, from 300 to 2,000 MBH, were defined as providing a suitable range of sizes for all of the commercial accounts being considered. The categories were defined as shown in the table below. The corresponding normalized annual gas use is also shown based on the trendline equation above. The 2006 annual gas use is determined from the equation below. The boiler size includes the oversizing factor. The annual gas use is the maximum total gas use able to be consumed by the boiler size (ie., a 600 MBH boiler will have a maximum annual seasonal gas use of 41,224 m3).

Table 3: Boiler Size & Annual Gas Use Categories

	Maximum Seasonal Gas Use (m3/yr)	
Boiler Size (MBH)	**30 Yr Normalized**	**2006**
300	20,391	16,951
400	27,335	22,724
500	34,279	28,497
600	41,224	34,270
700	48,168	40,044
800	55,113	45,817
1,000	69,332	57,363
1,200	82,891	68,909
1,500	103,724	86,228
2,000	138,446	115,094

2006 Annual Gas Use Calculation

The 2006 annual gas use is required to determine the number of accounts and average gas use in the Rate 6 accounts corresponding to the boiler size categories. This was calculated using the equation below.

Equation 2: 2006 Annual Gas Use Calculation

$$2006GasUse = NormGasUse \times \left(\frac{2006HDD}{NormHDD} \right)$$

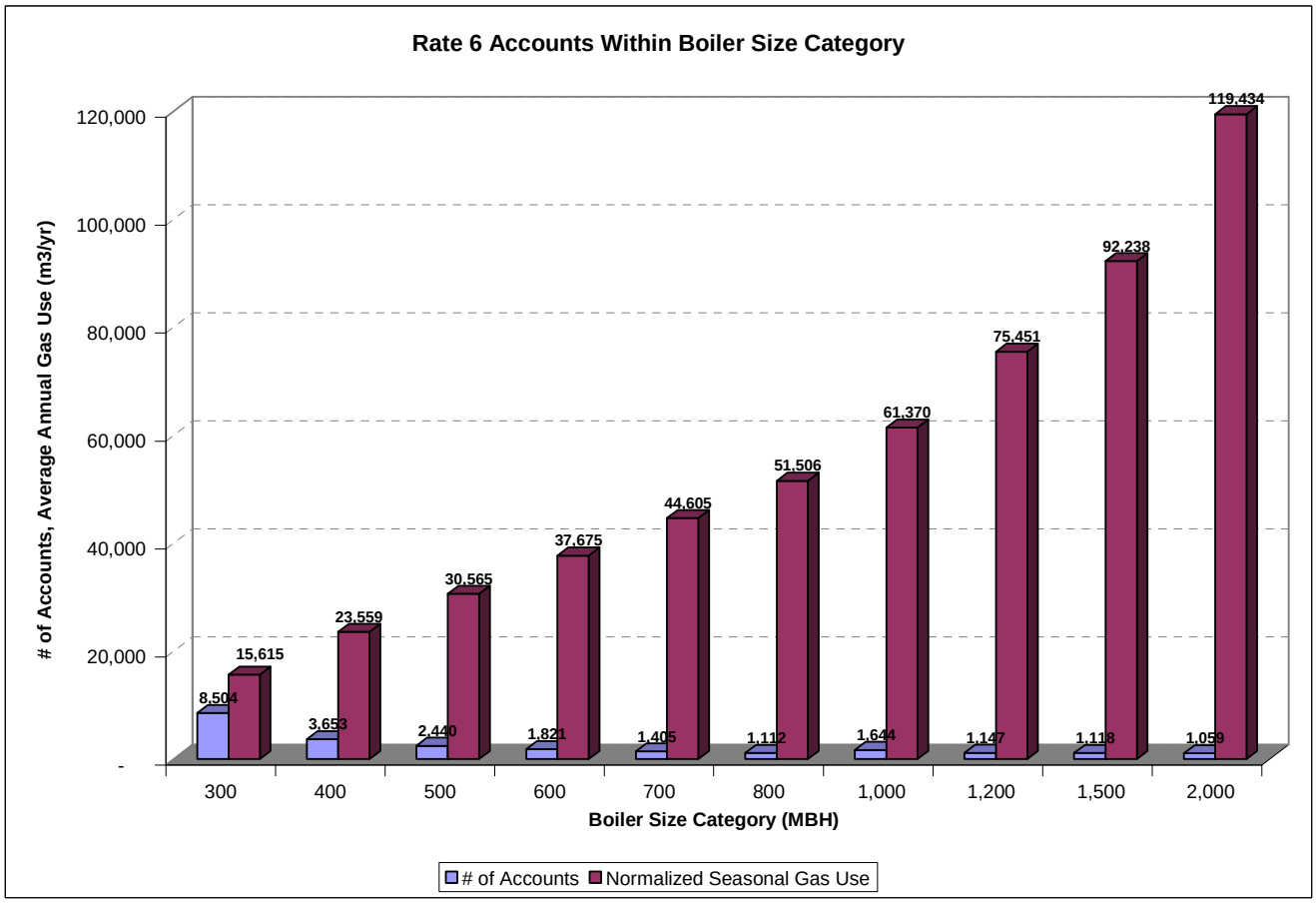
where:

2006GasUse = the 2006 annual gas use (m3)
NormGasUse = the normalized gas use (m3)
2006HDD = 3381 heating degree days
NormHDD = 4067 heating degree days

Average Gas Use Per Boiler Size Category

The Rate 6 accounts were compiled using the 2006 Maximum Seasonal Gas Use for the respective boiler size categories to determine the average monthly and annual gas use per category. A summary of the number of Rate 6 accounts as well as the 2006 Average Gas Use per boiler size category is shown in the figure and table below. The average is determined from the seasonal gas use of all accounts within the boiler size category (ie., for a boiler size of 600 MBH, there are 1,821 accounts having a 2006 seasonal consumption between 25,411 and 31,320 m3 and an average normalized seasonal gas use of 37,675 m3). Accounts having less than 10,000 m3 of 2006 annual gas use were not included in the 300 MBH boiler size category. These accounts were removed due to the large number of accounts having very small consumption.

Figure 1: Rate 6 Accounts Within Boiler Size Category



Notes:

1. *Boiler size category of 300 MBH does not include accounts below annual usage of 10,000 m3.*

Table 4: Rate 6 Accounts Within Boiler Size Category

Boiler Size MBH	# of Accounts	2006 Annual Sea. Gas Use	Average Normalized Seasonal Gas Use
300	8,504	12,981	15,615
400	3,653	19,585	23,559
500	2,440	25,410	30,565
600	1,821	31,320	37,675
700	1,405	37,081	44,605
800	1,112	42,818	51,506
1,000	1,644	51,018	61,370
1,200	1,147	62,724	75,451
1,500	1,118	76,679	92,238
2,000	1,059	99,288	119,434

Annual Seasonal Efficiency

The Annual Seasonal Efficiency was determined for each of the boiler combustion efficiency ranges and boiler sizes using the Boiler ETools' Seasonal Efficiency calculator. The Seasonal Efficiency was determined without the use of Intermittent Pumping due to the site specific nature of the piping and pumping configuration. A printout of the calculator for a boiler size of 600 MBH is included in Appendix C. Other boiler sizes have identical seasonal efficiency inputs and have not been shown for brevity. A summary of the Seasonal Efficiencies is included in the table below. The analysis compares the replacement seasonal efficiencies below versus the Existing seasonal efficiency determined above.

Table 5: Seasonal Efficiency

Combustion Efficiency	All Boiler Sizes (300 – 2,000 MBH)
80-82% [Base Case]	62.6%
83-84%	74.2%
85-88%	81.6%
89+%	85.1%

Average Boiler MSRP

Enbridge provided an assembled 2006 MSRP list for 366 various commercial boilers. A database was created of the boiler price list and queried to determine boiler costs based on boiler combustion efficiency and boiler size. The Average MSRP takes into account the prices for various construction types within the size band selected.

Four combustion efficiency ranges were used in the analysis:

- 80-82% [Base Case]
- 83-84%
- 85-88%
- 89+%

Figure 2: Boiler MSRP

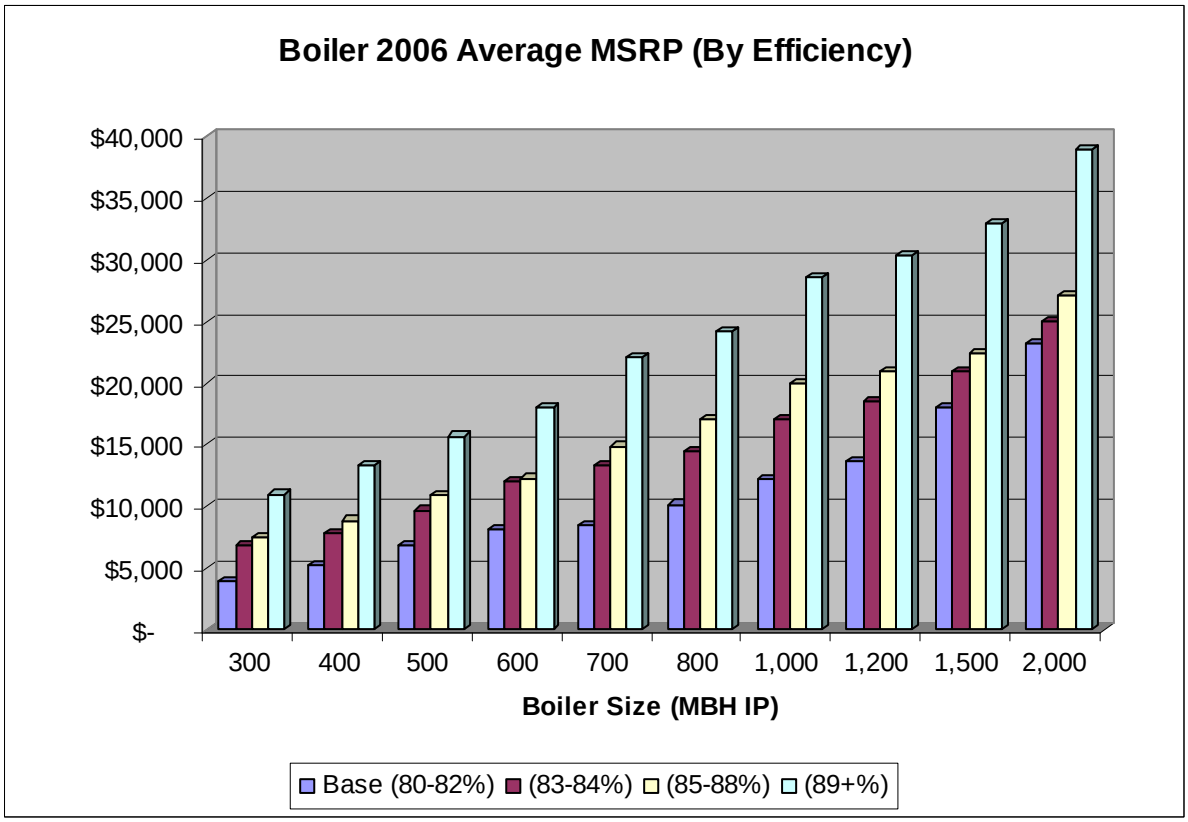


Table 6: Boiler MSRP

2006 Average MSRP ($)	Boiler Size (MBH IP)									
	300	400	500	600	700	800	1,000	1,200	1,500	2,000
Base (80-82%)	$ 4,000	$ 5,200	$ 6,900	$ 8,100	$ 8,500	$ 10,200	$ 12,200	$ 13,700	$ 18,100	$ 23,300
(83-84%)	$ 6,900	$ 7,900	$ 9,700	$ 12,100	$ 13,400	$ 14,500	$ 17,100	$ 18,600	$ 21,000	$ 25,000
(85-88%)	$ 7,500	$ 8,900	$ 10,900	$ 12,300	$ 14,900	$ 17,100	$ 20,000	$ 21,000	$ 22,500	$ 27,100
(89+%)	$ 11,000	$ 13,300	$ 15,700	$ 18,000	$ 22,100	$ 24,200	$ 28,600	$ 30,360	$ 33,000	$ 39,000

Additional Installation Costs

Additional installation costs may be needed to implement the higher efficiency boilers versus the Base Case boiler. The Base Case boiler would typically be an atmospheric or natural draft appliance having a Venting Category of I (non-positive pressure, non-condensing). Higher efficiency boilers are typically power burner or fan assisted combustion and may involve condensation in the flue gas. These boilers require different venting materials and connections according to the category such as:

- Category II: non-positive pressure, condensing
- Catergory III: positive pressure, non-condensing
- Categiry IV: positive pressure, condensing

Installation of the higher efficiency equipment will involve additional venting costs versus replacement with a standard base case boiler. The table below provides an estimate of the additional installation costs based on boiler size. Explanation of the source of the values is provided below.

Table 7: Additional Installation Costs

	Flue Venting Installation				**Base Case Chimney Removal**			
Boiler Size (MBH)	Size (“)	Length (ft)	$/L.F. Incl O&P	Total ($)	Labour ($/hr)	Labour (hrs)	Total Labour ($)	Total [Rounded] ($)
300	4”	16	$50	$800	67.4	2.5	$169	$1,000
400	4”	16	$50	$800	67.4	2.5	$169	$1,000
500	6”	16	$62	$1,550	67.4	2.5	$169	$1,800
600	6”	25	$62	$1,550	67.4	2.5	$169	$1,800
700	8”	25	$75	$2,250	67.4	2.5	$169	$2,500
800	8”	25	$75	$2,250	67.4	2.5	$169	$2,500
1,000	8”	30	$75	$2,250	67.4	2.5	$169	$2,500
1,200	10”	30	$83	$2,490	67.4	2.5	$169	$2,700
1,500	12”	30	$94	$2,820	67.4	2.5	$169	$3,000
2,000	14”	30	$106	$3,180	67.4	2.5	$169	$3,250

Flue Venting

- Size: The flue vent size is taken from 2008 ASHRAE Handbook, HVAC Systems and Equipment, 34.13, Fig.7 Design Chart for Vents, Chimneys and Ducts as well as Figures 9-11.
- Length: This is an estimate. The different lengths are based on the general idea that smaller boilers are located in smaller rooms with less equipment and close to an outside wall. Larger boilers are in larger rooms with higher ceilings and require longer venting distances.
- $/L.F. Incl O&P: This value is taken from the 2007 RMS Mechanical Cost Data section 23 51 26.10 All-Fuel Vent Chimneys, Pressure Tight, Double Wall.

Base Case Chimney Removal

- Labour ($/hr): This value is taken from the 2007 RMS Mechanical Cost Data section wage rate for Plumbers.
- Labour (hrs): An estimate of the time required for the removal/capping/patching of the existing chimney.

TRC Analysis – Seasonal Boiler

The table and figure below show the TRC savings analysis of the respective combustion efficiency ranges. This includes the MSRP, incremental cost, gas use and savings, as well as the net TRC benefit. The TRC analysis is based on a 'Boiler Replacement' measure using a free-ridership of 12%, a measure life of 25yrs and energy cost projections from 2009 to 2038. Inputs for the TRC Analysis are included in Appendix D.

Figure 3: TRC of Boiler Size and Efficiency

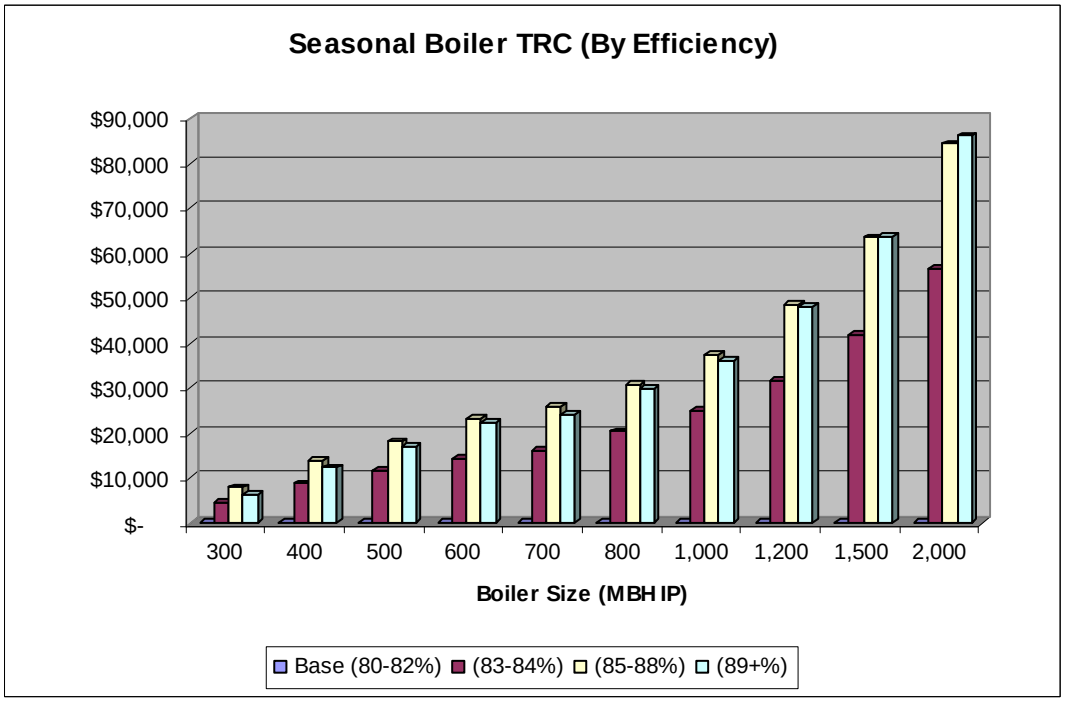


Table 8: TRC of Boiler Size and Efficiency

TRC ($)	Seasonal Boiler Size (MBH IP)									
	300	**400**	**500**	**600**	**700**	**800**	**1,000**	**1,200**	**1,500**	**2,000**
Base (80-82%)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
(83-84%)	$ 4,543	$ 8,772	$ 11,561	$ 14,134	$ 16,265	$ 20,316	$ 24,827	$ 31,842	$ 41,908	$ 56,633
(85-88%)	$ 7,879	$ 13,727	$ 18,074	$ 23,290	$ 25,992	$ 30,785	$ 37,471	$ 48,416	$ 63,433	$ 84,363
(89+%)	$ 6,405	$ 12,280	$ 16,991	$ 22,146	$ 24,241	$ 29,833	$ 36,215	$ 47,934	$ 63,676	$ 86,170

Non-Seasonal Gas Use

Small commercial facilities use non-seasonal boiler gas use for a number of different purposes depending on the type of facility and commercial sector. As an example; the food service sector uses hot water for washing dishes, facility cleanup, and guest domestic use in washrooms. Hotels/motels use hot water for laundry, kitchen (if on-site) and guest domestic use. Car washes use warm water for washing cars.

Boiler Plant Sizing Analysis

Sizing the non-seasonal boiler plant varies depending on the demand for hot water and the storage capacity available as shown in the example in ASHRAE Applications 49.15, Table 9.

The load diversity is specific to the type of facility and commercial sector. Generic daily load profiles for the motel, restaurant, and coin-op laundries sectors are provided in the DOE report "Commercial Heat Pump Water Heaters". Specific load profile data for monitored commercial buildings including a nursing home, dormatory and restaurant are provided in the report by W.H. Thrasher and D.W. DeWerth, 1994. Monitoring of multi-res facilities is included in the report by F.S. Goldner, 1994.

The boiler plant sizing was completed using several steps. Sample values for the 10-20,000 Btu/yr Rate 6 annual gas use bin are included. Others Bin values are calculated similarly.

Daily Average Gas Use

Goldner 1994, found a seasonal variation in domestic hot water (DHW) use in multi-res facitilies with additional use being shown during the winter and spring versus summer and fall periods. Both EPRI 1990 and Thrasher et. al. 1994, suggest a seasonal variation of energy use for water heating based on the inlet water temperature with highest energy use being required during winter periods and lowest during summer.

This analysis uses a straight-line basis for determining the daily average gas use. This provides a more conservative value versus using a seasonal variation.

Equation 3: Non-seasonal Average Daily Gas Use

$$GasUse_{AveDaily} = GasUse_{Annual} \times \left(\frac{8.33\%}{30.42} \right)$$

where:

$GasUse_{AveDaily}$ = the average daily non-seasonal gas use (m3/day)
$GasUse_{Annual}$ = the non-seasonal annual gas use (m3/yr)
8.33% = % of monthly non-seasonal gas use (=100%/12months)
30.42 = the average days per month in a year (=365/12 days/month)

An annual non-seasonal gas use of 4,230 m3/yr in the 10-20,000 Bin has an average daily gas use of 11.58 m3/day.

Peak Hourly Gas Use

Table 2 of the DOE 2000 report provides generic daily load profiles on an hourly basis for several types of commercial facilities. The maximum hourly demand for these facilities is 14.7%, 17.4%, and 11.1% of total daily use for motels, full services restaurants and coin-op laundry facilities respectively. A value of 15% is used in the analysis for determining the general maximum hourly demand.

Equation 4: Non-seasonal Peak Hourly Gas Use

$$GasUse_{PeakHr} = GasUse_{AveDaily} \times 15\%$$

where:

$GasUse_{PeakHr}$ = the peak hour non-seasonal gas use (m3/hr)
$GasUse_{AveDaily}$ = the daily average non-seasonal gas use (m3/day)
15% = % of peak hour to average daily gas use

An average daily gas use of 11.58 m3/day has a peak hour gas use of 1.738 m3/hr.

Peak 15 Minute Gas Use

The amount of hot water storage capacity is a consideration of the peak boiler size requirement. ASHRAE A49.11 states that residential water-heating equipment sizing is frequently driven by amounts of water used over periods of considerably less than 1 hour and often as short as 15 minutes. The literature review did not find any reports or data that suggested anything different for commercial facilities.

The table below indicates average peak 15 minute demand versus average peak hourly demand.

Table 9: Non-seasonal Average Peak 15 Minute Demand Vs. Hourly

Facility/Water Use	Average Peak 15 Minute Demand of Hourly	Reference
Nursing Home/Laundry	36.3%	Trasher et. al. 1994
Nursing Home/DHW	41.7%	Trasher et. al. 1994
Dormatory/Co-ed	48.6%	Trasher et. al. 1994
Dormatory/Womens	46.9%	Trasher et. al. 1994
Hotel/Laundry	36.6%	Trasher et. al. 1994
Hotel/DHW	29.4%	Trasher et. al. 1994
Multi-res	34%	Goldner 1994

The analysis uses a value of 30% average peak 15 minute demand versus average peak hourly. This provides a conservative value and allows for a greater than 15 minutes storage capacity. The average peak 15 minute value is used to re-calculate the peak demand on an hourly basis for sizing the boiler.

Equation 5: Non-seasonal Peak 15min Gas Use

$$GasUse_{Peak15\,min} = GasUse_{PeakHr} \times 30\%$$

where:

GasUse$_{Peak15min}$ = the peak 15min non-seasonal gas use (m3/15min)
GasUse$_{PeakHr}$ = the peak hour non-seasonal gas use (m3/hr)
30% = % of average peak 15 minute to average peak daily gas use

An average peak hourly gas use of 1.738 m3/hr has an average peak 15 minute gas use of 0.521 m3/15min.

Plant Boiler Size

The boiler size must provide the peak 15 minute gas use as well as any oversizing factor. Goldner, 1994 discusses that DHW generating systems and combined heating/DHW systems are frequently oversized by between 30% and 200%. This analysis uses a 30% oversizing factor. The boiler plant size is calculated below.

Equation 6: Non-seasonal Boiler Plant Size

$$BoilerSize_{NonSeasonal} = GasUse_{Peak15\,min} \times (1 + Oversize) \times 4 \times \frac{35{,}300}{1{,}000}$$

where:

BoilerSize$_{NonSeasonal}$ = the boiler plant input size (MBH)
GasUse$_{Peak15min}$ = the peak 15min non-seasonal gas use (m3/15min)
Oversize = the oversize factor, 30%
4 = conversion of 15 minute intervals to 1 hr intervals
35,300 = calorific value of natural gas (Btu/m3)
1,000 = conversion of Btu/hr to MBH

An average peak 15 minute gas use of 0.521 m3/hr has a boiler size of 96 MBH. The table and figure show boiler sizing for the respective gas use bins and Rate 6 non-seasonal gas use. A linear trendline was developed for non-seasonal boiler plant sizing from the data.

Equation 7: Non-seasonal Boiler Size Equation

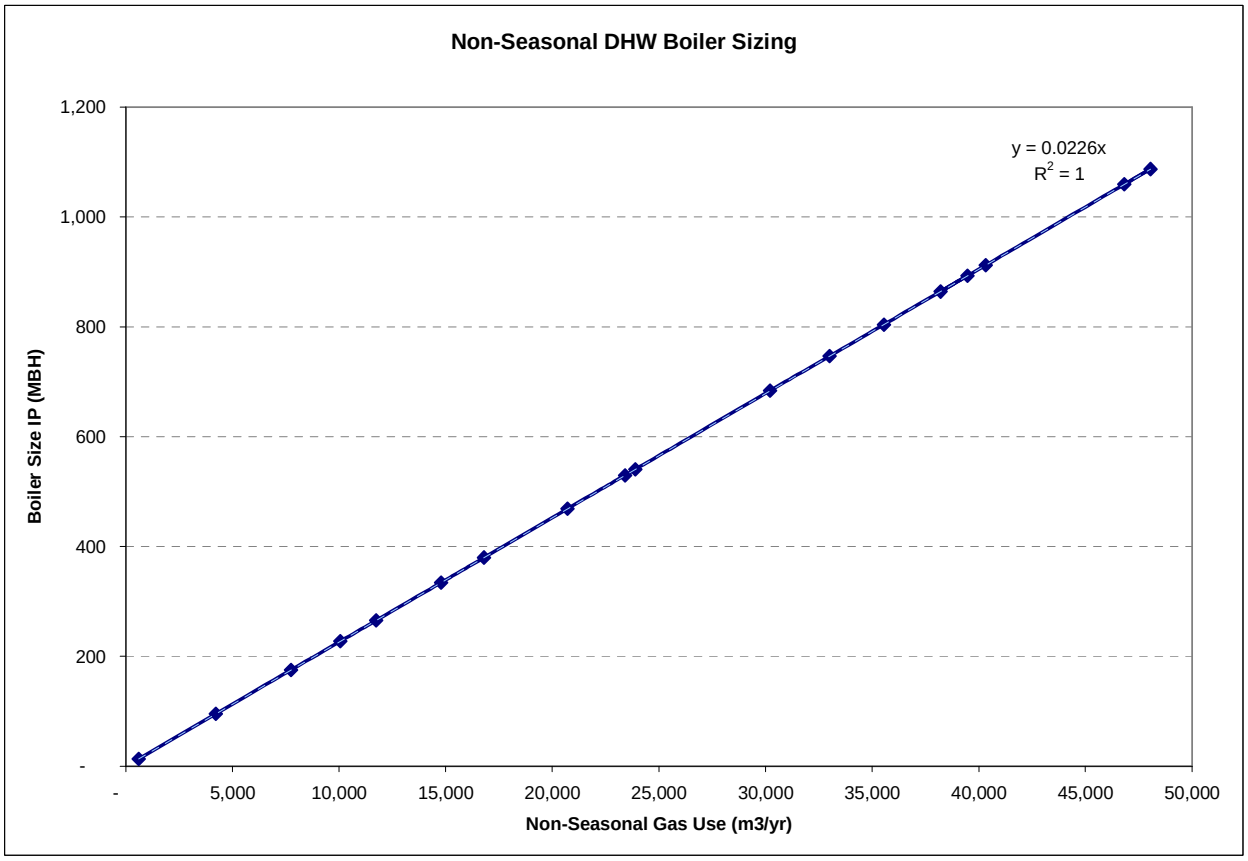
$$y = 0.0226x$$

where:

y = non-seasonal boiler size (MBH)
x = non-seasonal gas use (m3/yr)

Table 10: Non-seasonal Boiler Sizing Per Bin

Gas Use Bin		Non-Seasonal	Boiler IP
Low	High	Gas Use (m3/yr)	(MBH)
-	10,000	595	13
10,000	20,000	4,230	96
20,000	30,000	7,752	175
30,000	40,000	10,059	228
40,000	50,000	11,736	265
50,000	60,000	14,786	334
60,000	70,000	16,804	380
70,000	80,000	20,714	469
80,000	90,000	23,406	529
90,000	100,000	23,890	540
100,000	110,000	30,216	684
110,000	120,000	32,999	746
120,000	130,000	35,541	804
130,000	140,000	39,471	893
140,000	150,000	38,202	864
150,000	160,000	40,322	912
160,000	170,000	48,046	1,087
170,000	180,000	46,820	1,059



Boiler Size Categories

Similar to the seasonal boiler sizing; ten boiler size categories, from 300 to 2,000 MBH, were defined as providing a suitable range of sizes for all of the commercial accounts being considered for non-seasonal gas use. The categories were defined as shown in the table below. The corresponding non-seasonal annual gas use is also shown based on the trendline equation above. The non-seasonal gas use is the maximum total gas use able to be consumed by the boiler size (ie., a 600 MBH boiler will have a non-seasonal gas use of 26,549 m3). The number of Rate 6 accounts within each boiler size category are included in the table. Accounts with a total 2006 gas use or a non-seasonal gas use below 10,000 m3 were removed due to the large number of accounts having no or very little gas use. These accounts would require a non-seasonal boiler size of less than approximately 200 MBH.

Table 11: Non-seasonal Boiler Size & Annual Gas Use Categories

Boiler Size (MBH)	# Accounts	Annual Gas Use (m3/yr)	Ave Gas Use (m3/yr)
300	2,029	10,000 – 13,274	11,468
400	1,698	13,275 – 17,699	15,378
500	1,303	17,700 – 22,124	19,841
600	946	22,125 – 26,549	24,184
700	690	26,550 – 30,973	28,597
800	458	30,974 – 35,398	33,031
1,000	578	35,399 – 44,248	39,644
1,200	187	44,249 – 48,000	46,075
1,500	Above Rate 6 account gas use		
2,000	Above Rate 6 account gas use		

Annual Seasonal Efficiency

The Annual Seasonal Efficiency was determined for each of the boiler combustion efficiency ranges and boiler sizes using the Boiler ETools' Seasonal Efficiency DHW calculator. The Seasonal Efficiency was determined without the use of Intermittent Pumping due to the site specific nature of the piping and pumping configuration. A printout of the calculator for a boiler size of 600 MBH is included in Appendix C. Other boiler sizes have identical seasonal efficiency inputs and have not been shown for brevity. A summary of the Seasonal Efficiencies is included in the table below. The analysis compares the replacement seasonal efficiencies below versus the Existing seasonal efficiency determined above.

Table 12: Seasonal Efficiency

Combustion Efficiency	All Boiler Sizes (300 – 2,000 MBH)
75% [Existing]	57.2% (Shown in App.B)
80-82% [Base Case]	65.6%
83-84%	73.5%
85-88%	79.6%
89+%	83.1%

Average Boiler MSRP

Boiler prices as determined above for the seasonal gas use boilers are used for the non-seasonal boilers.

Additional Installation Costs

Additional installation costs as determined above for the seasonal gas use boilers are used for the non-seasonal boilers.

TRC Analysis

The table and figure below show the TRC savings analysis of the respective combustion efficiency ranges. This includes the MSRP, incremental cost, gas use and savings, as well as the net TRC benefit. The TRC analysis is based on a 'Boiler Replacement' measure using a free-ridership of 12%, a measure life of 25yrs and energy cost projections from 2009 to 2038. Inputs for the TRC Analysis are included in Appendix E.

Figure 4: TRC of Boiler Size and Efficiency

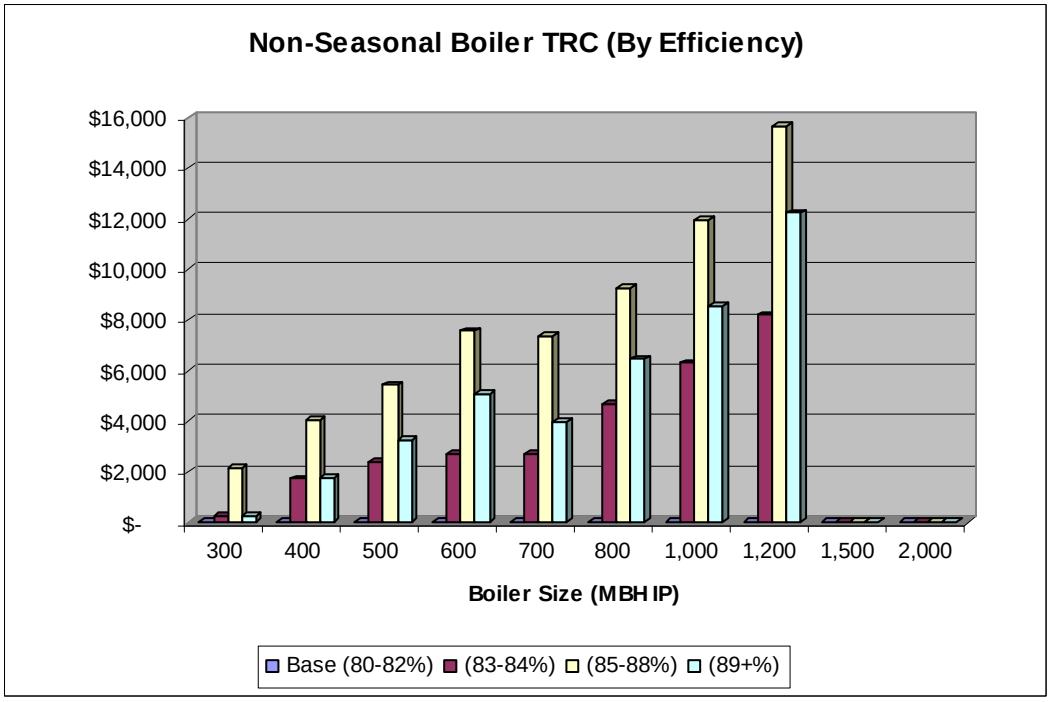
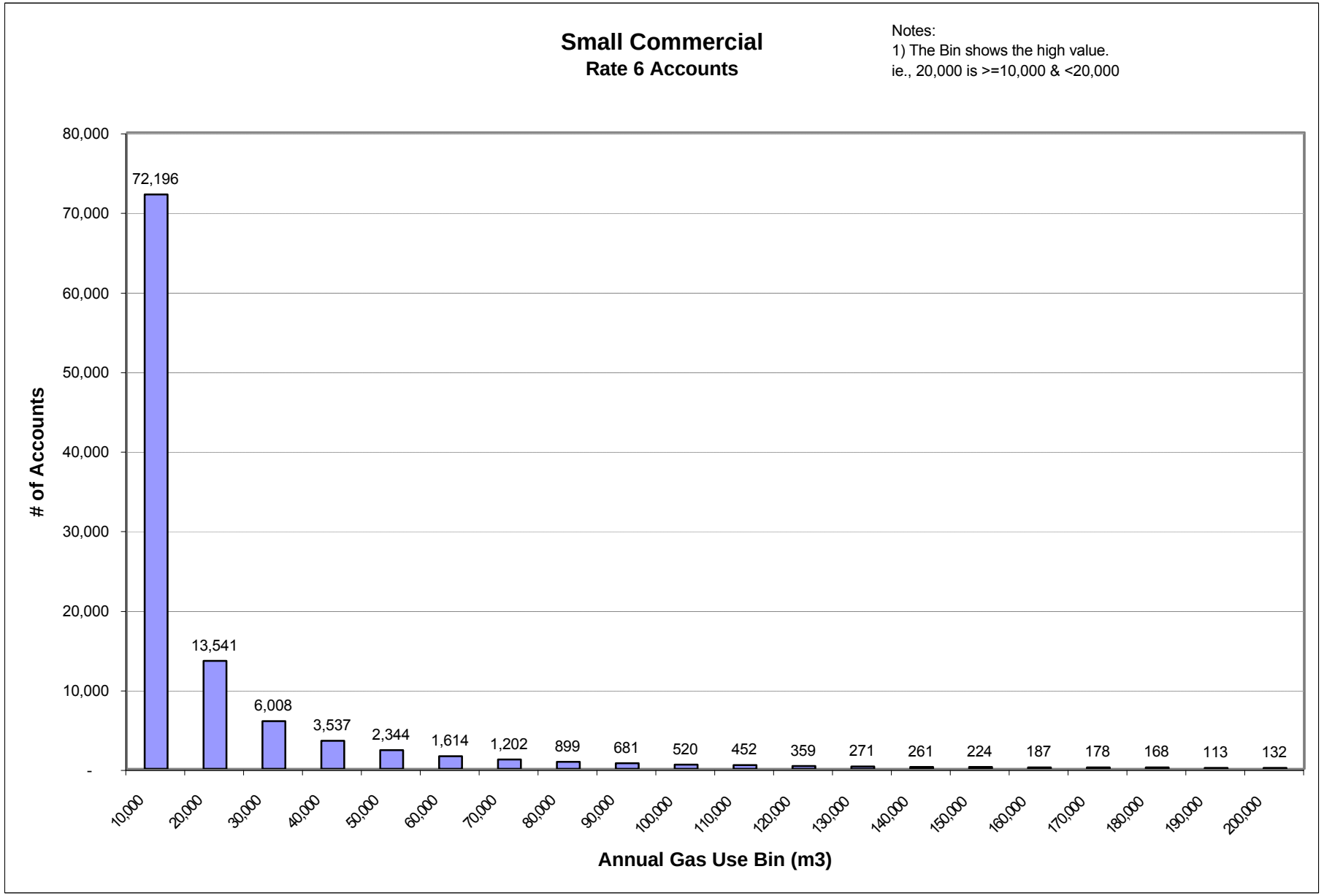


Table 13: TRC of Boiler Size and Efficiency

TRC ($)

	Non-Seasonal Boiler Size (MBH IP)									
	300	**400**	**500**	**600**	**700**	**800**	**1,000**	**1,200**	**1,500**	**2,000**
Base (80-82%)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
(83-84%)	$ 274	$ 1,712	$ 2,361	$ 2,708	$ 2,724	$ 4,686	$ 6,296	$ 8,195	$ -	$ -
(85-88%)	$ 2,128	$ 4,028	$ 5,428	$ 7,559	$ 7,351	$ 9,266	$ 11,983	$ 15,661	$ -	$ -
(89+%)	$ 244	$ 1,759	$ 3,273	$ 5,063	$ 3,994	$ 6,459	$ 8,546	$ 12,226	$ -	$ -

Appendix A
ANNUAL GAS USE; RATE 6 ACCOUNTS


Small Commercial
Rate 6 Accounts
Notes:
1) The Bin shows the high value.
ie., 20,000 is >=10,000 & <20,000
# of Accounts
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
72,196
13,541
6,008
3,537
2,344
1,614
1,202
899
681
520
452
359
271
261
224
187
178
168
113
132
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
110,000
120,000
130,000
140,000
150,000
160,000
170,000
180,000
190,000
200,000
Annual Gas Use Bin (m3)

2006 Monthly & Annual Average Gas Use Per Bin

Gas Use Bin		Count	Monthly Average												Annual Ave
Low	High	ID1	_00601	_00602	_00603	_00604	_00605	_00606	_00607	_00608	_00609	_00610	_00611	_00612	tot_200601_12
-	10,000	72,196	594	519	570	291	137	65	51	48	51	123	320	413	3,181
10,000	20,000	13,541	2,467	2,116	2,355	1,353	747	462	362	352	352	654	1,366	1,585	14,171
20,000	30,000	6,008	4,173	3,592	4,026	2,321	1,357	832	670	634	650	1,178	2,392	2,663	24,488
30,000	40,000	3,537	6,016	5,143	5,806	3,271	1,943	1,119	879	834	822	1,604	3,370	3,789	34,595
40,000	50,000	2,344	7,854	6,854	7,474	4,489	2,406	1,359	1,037	983	939	1,967	4,315	4,965	44,642
50,000	60,000	1,614	9,669	8,322	9,218	5,282	3,168	1,670	1,308	1,262	1,159	2,417	5,271	6,009	54,751
60,000	70,000	1,202	11,010	9,747	10,909	6,430	3,877	1,998	1,421	1,354	1,458	2,998	6,227	7,257	64,685
70,000	80,000	899	12,601	11,047	12,748	7,666	4,275	2,510	1,732	1,723	1,764	3,358	7,099	8,232	74,755
80,000	90,000	681	14,300	12,523	14,188	8,535	4,832	2,785	2,032	1,880	1,986	3,908	8,363	9,533	84,864
90,000	100,000	520	16,159	14,344	16,164	9,555	5,392	2,937	1,971	2,111	1,940	4,281	9,366	10,791	95,012
100,000	110,000	452	17,464	15,418	17,183	10,889	5,997	3,899	2,834	2,243	2,537	4,891	10,062	11,499	104,915
110,000	120,000	359	19,607	16,554	18,639	11,575	7,132	4,026	3,081	2,649	2,592	5,455	11,183	12,393	114,886
120,000	130,000	271	20,308	18,041	20,269	14,185	6,702	5,029	3,138	2,975	2,848	6,264	11,412	13,797	124,968
130,000	140,000	261	22,453	20,036	21,924	13,757	8,385	4,579	3,465	3,158	3,323	6,808	12,202	14,895	134,986
140,000	150,000	224	23,117	21,328	24,824	15,065	9,084	5,301	3,414	2,780	3,426	7,250	13,712	15,744	145,044
150,000	160,000	187	26,111	22,955	26,179	15,811	9,447	4,785	3,752	2,977	3,431	7,445	15,556	16,438	154,885
160,000	170,000	178	28,249	25,186	27,132	16,007	9,421	5,908	4,333	3,728	4,046	8,593	14,513	17,704	164,818
170,000	180,000	168	28,894	26,900	30,194	18,560	10,138	5,936	3,891	4,440	3,483	7,838	14,737	19,684	174,694
180,000	190,000	113	32,569	28,323	30,901	18,036	10,985	5,067	5,528	3,574	3,739	10,031	16,201	19,835	184,739
190,000	200,000	132	30,768	29,219	32,467	20,240	12,316	5,769	4,300	4,014	4,175	10,561	18,444	22,658	194,930

Normalized Gas Use Per Bin

Gas Use Bin				Total
Low	High	Seasonal	Non-Seasonal	Gas Use (m3)
-	10,000	3,134	595	3,729
10,000	20,000	12,041	4,230	16,271
20,000	30,000	20,271	7,752	28,023
30,000	40,000	29,719	10,059	39,778
40,000	50,000	39,857	11,736	51,593
50,000	60,000	48,410	14,786	63,196
60,000	70,000	57,994	16,804	74,798
70,000	80,000	65,454	20,714	86,168
80,000	90,000	74,439	23,406	97,845
90,000	100,000	86,144	23,890	110,034
100,000	110,000	90,475	30,216	120,691
110,000	120,000	99,182	32,999	132,181
120,000	130,000	108,315	35,541	143,856
130,000	140,000	115,689	39,471	155,160
140,000	150,000	129,408	38,202	167,610
150,000	160,000	138,761	40,322	179,083
160,000	170,000	141,436	48,046	189,482
170,000	180,000	154,883	46,820	201,703

Normalize Data

Program Ver. e1-07, 01-Aug-08

Project ID: Small Commercial
Address: Bin20000
ESC Name: -
Project Location: Toronto

Business Partner: -
Customer: -
Date: 25-May-09
Site Type: -

Balance Point Temperature 18

Montly Data

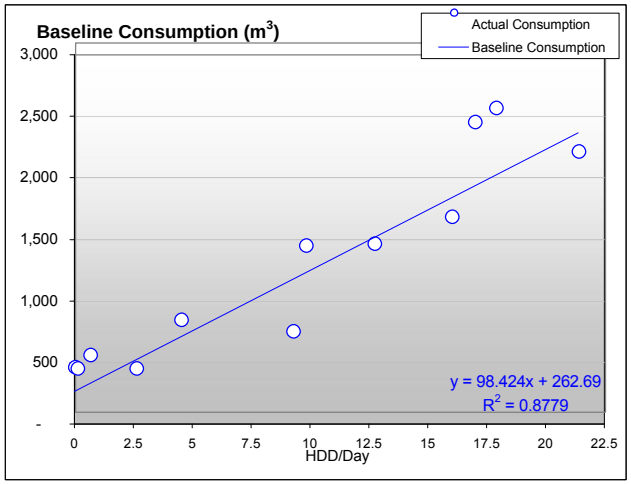
D H W	Bill Date	Billing Period (days)	Bill Period HDD	Bill Gas Consumption (m^3)	Base load (m^3)	Actual Seasonal Load (m^3)	Bill Period HDD 30yr. average	Normalised Seasonal Load (m^3)	Normalised Consumption (m^3)
☐ Jan-06	1/31/2006	31	555	2,467	359	1,591	753	1,927	**2,286**
☐ Feb-06	2/28/2006	28	599	2,116	324	1,789	662	2,167	**2,492**
☐ Mar-06	3/31/2006	31	526	2,355	359	1,292	572	1,565	**1,925**
☐ Apr-06	4/30/2006	30	294	1,353	348	1,094	353	1,325	**1,672**
☐ May-06	5/31/2006	31	140	747	359	696	172	843	**1,202**
☐ Jun-06	6/30/2006	30	19	462	348	0	49	0	**348**
☐ Jul-06	7/31/2006	31	0	362	359	0	9	0	**359**
☐ Aug-06	8/31/2006	31	3	352	359	0	18	0	**359**
☐ Sep-06	9/30/2006	30	78	352	348	596	103	722	**1,070**
☐ Oct-06	10/31/2006	31	288	654	359	696	283	843	**1,202**
☐ Nov-06	11/30/2006	30	382	1,366	348	895	446	1,084	**1,431**
☐ Dec-06	12/31/2006	31	496	1,585	359	1,292	647	1,565	**1,925**
Totals		**365**	**3381**	**14,172**	4,230	9,942	4,067	12,041	**16,271**

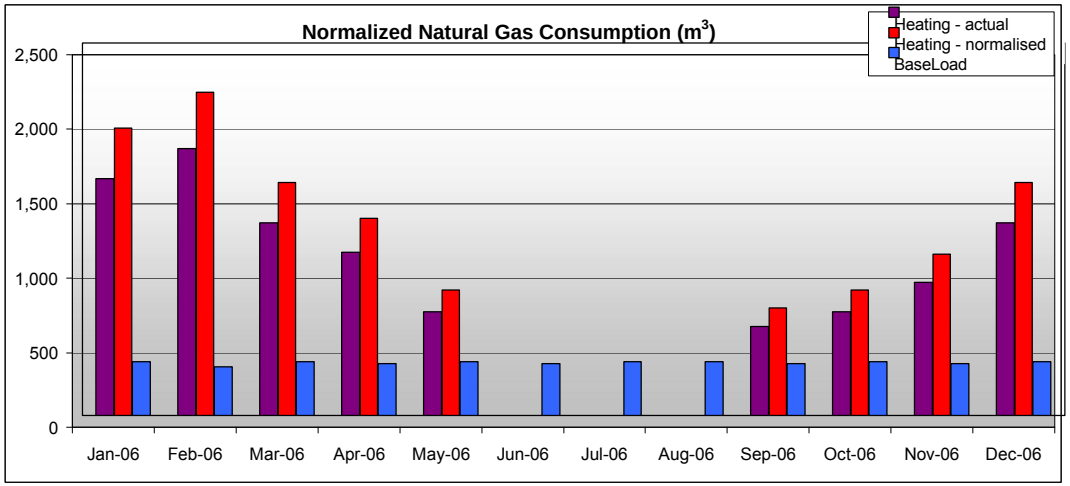
Gas Bills From ESM

Total Annual Consumption (m^3/yr)

	Seasonal	Non-Seasonal			
	Normalized	DHW	Cooking	Other	Total
18	Htg Boilers	(m^3/yr.)	(m^3/yr.)	(m^3/yr.)	(m^3/yr.)
21		**4,230**	**0**	**0**	**4,230**

17	**12,041**
10	
5	**MUA**
1	**0**
0	
0	**Other**
3	**0**
9	
13	**Total**
16	**12,041**





Appendix B
BOILER SIZING

Boiler Selection Tool

Program Ver.e1-07 - 01-Aug-08

Project ID: Small Commercial **Business Partner:** 0
Address: Bin20000 **Customer:** 0
ESC Name: 0 **Date:** 25-May-09

Existing System

	Manufacturer	Model	Qty	Unit Input ('000 Btu/h)	Total Input ('000 Btu/h)	Combustion Efficiency (%)	Heating Ouput ('000 Btu/h)	Seasonal Efficiency (%)	Estimated Annual Gas Usage (m3)
Space Heating (Seasonal)									
Existing #1	Other Boiler		**1**	750	750	75	563		
Existing #2	None		**0**	-	-	-	-		
				Sub-Total	**750**	**75.0**	**563**	**53.76**	**12,041**
Domestic Hot Water (Non-Seasonal)									
Existing #1	Other Boiler		**1**	100	100	75	75		
Existing #2	None		**0**	-	-	-	-		
				Sub-Total	**100**	**75.0**	**75**	**57.16**	**4,230**
								Totals	**16,271**

--

New System A

Final Selection

	Manufacturer	Model	Qty	Unit Input ('000 Btu/h)	Total Input (MBH)	Combustion Efficiency (%)	Heating Ouput ('000 Btu/h)	Seasonal Efficiency (%)	Estimated Annual Gas Usage (m3)	Est. Annual Gas Savings (m3)
Space Heating (Seasonal)										
NewA #1	None		**0**	-	-	-	-			
NewA #2	None		**0**	-	-	-	-			0.0%
				Sub-Total	**-**	**-**	**-**	**-**	**-**	**-**
Domestic Hot Water (Non-Seasonal)										
NewA #1	None		**0**	-	-	-	-			
NewA #2	None		**0**	-	-	-	-			0.0%
				Sub-Total	**-**	**-**	**-**	**-**	**-**	**-**
								Totals	**-**	**-**
										0.0%

--

New System B

Final Selection

	Manufacturer	Model	Qty	Unit Input ('000 Btu/h)	Total Input (MBH)	Combustion Efficiency (%)	Heating Ouput ('000 Btu/h)	Seasonal Efficiency (%)	Estimated Annual Gas Usage (m3)	Est. Annual Gas Savings (m3)
Space Heating (Seasonal)										
NewB #1	None		**0**	-	-	-	-			
NewB #2	None		**0**	-	-	-	-			0.0%
				Sub-Total	**-**	**-**	**-**	**-**	**-**	**-**
Domestic Hot Water (Non-Seasonal)										
NewB #1	None		**0**	-	-	-	-			
NewB #2	None		**0**	-	-	-	-			0.0%
				Sub-Total	**-**	**-**	**-**	**-**	**-**	**-**
								Totals	**-**	**-**
										0.0%

--

Lead - Lag

	Manufacturer	Model	Qty	Unit Input ('000 Btu/h)	Total Input (MBH)	Combustion Efficiency (%)	Heating Ouput ('000 Btu/h)	Seasonal Efficiency (%)	Estimated Annual Gas Usage (m3)	Est. Annual Gas Savings (m3)
Space Heating (Seasonal)										
Lead #1	Other Boiler		**1**	140	140	75	105			
Lead #2	None		**0**	-	-	-	-			0.0%
Lead Portion 100%				**Sub-Total**	140	**75.0**	**105**	**53.76**	**12,041**	**(0)**
Domestic Hot Water (Non-Seasonal)										
Lead	None		**0**	-	-	-	-			
Lag	None		**0**	-	-	-	-			0.0%
				Sub-Total	**-**	**-**	**-**	**-**	**-**	**-**
								Totals	**12,041**	**(0)**
										0.0%

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Seasonal Efficiency

Project ID: Small Commercial **Business Partner:** 0
Address: Bin20000 **Customer:** 0
Program Ver.e1-07 - 01-Aug-08 **ESC Name:** 0 **Date:** 25-May-09

Space Heating

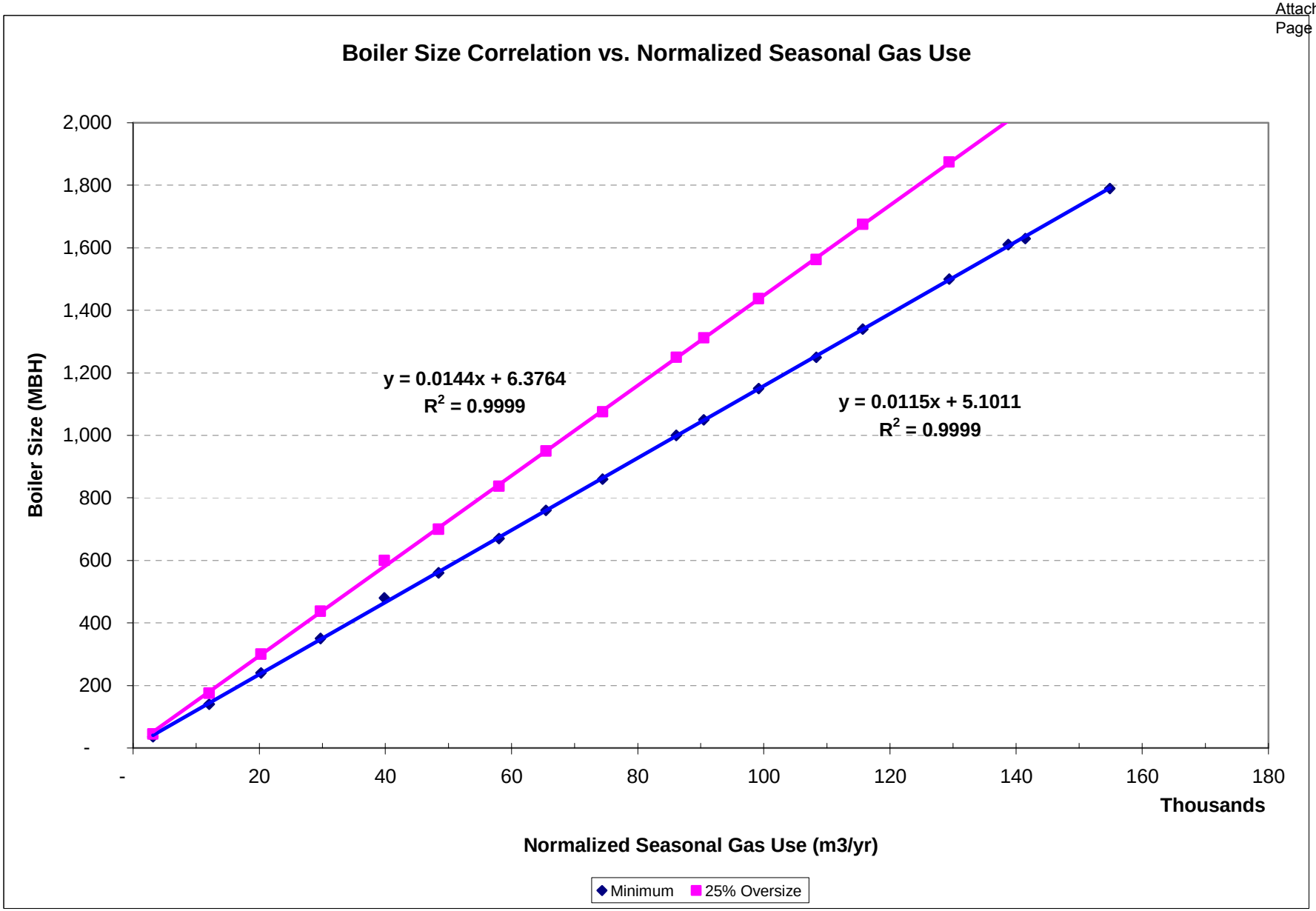
	Existing		New A		New B		Lead-Lag	
	Selection	Loss %	Selection	Loss %	Selection	Loss %	Selection	Loss %
Boiler Combustion Efficiency	**75.0 %**		**0.0 %**		**0.0 %**		**75.0 %**	
Boiler Pumping	Continuous		Intermittent		Intermittent		Continuous	
Flue Damping*	None		None		None		None	
Oversizing Ratio [Calculated]	1.0	[1.8]	1		1		1	
Total # Heating Stages	1		1		1		1	
Maximum Supply Water Temperature**	180 F	14.40	180 F	7.20 %	180 F	7.20 %	180 F	14.40 %
Jacket Average Temp.	130 F	1.64 %	90 F	0.55 %	90 F	0.55 %	130 F	1.64 %
I/O Control with Reset**	Old	2.00 %	New	0.00 %	New	0.00 %	Old	2.00 %
A/F Control*	None	3.20 %	None	3.20 %	None	3.20 %	None	3.20 %
Purge Cycles*	None	0.00 %	None	0.00 %	None	0.00 %	None	0.00 %
Total losses		**21.24 %**		**10.95 %**		**10.95 %**		**21.24 %**
Estimated Seasonal Efficiency		**53.76 %**		**0.00 %**		**0.00 %**		**53.76 %**

** Values set from Database, ** Values Used For Control Upgrade*

Domestic Hot Water

	Existing		New A		New B		Lead-Lag	
	Selection	Loss %	Selection	Loss %	Selection	Loss %	Selection	Loss %
Boiler Combustion Efficiency	**75.0 %**		**0.0 %**		**0.0 %**		**0.0 %**	
Boiler Pumping	Continuous		Intermittent		Intermittent		Intermittent	
Flue Damping*	None		None		None		None	
Oversizing Ratio	1.3		1		1		1	
Total # Heating Stages	1		1		1		1	
Maximum Supply Water Temperature**	140 F	7.15 %	140 F	2.75 %	140 F	2.75 %	140 F	2.75 %
Jacket Average Temp.	110 F	1.09 %	90 F	0.55 %	90 F	0.55 %	90 F	0.55 %
Controls**	None / non-functional	2.40 %	New	0.00 %	New	0.00 %	New	0.00 %
A/F Control*	None	3.20 %	None	3.20 %	None	3.20 %	None	3.20 %
Purge Cycles*	None	0.00 %	None	0.00 %	None	0.00 %	None	0.00 %
DHW Tank Insulation	Good	4.00 %	Good	4.00 %	Good	4.00 %	Good	4.00 %
Total losses		**17.84 %**		**10.49 %**		**10.49 %**		**10.49 %**
Estimated Seasonal Efficiency		**57.16 %**		**0.00 %**		**0.00 %**		**0.00 %**

** Values set from Database, ** Values Used For Control Upgrade*


Boiler Size Correlation vs. Normalized Seasonal Gas Use
Boiler Size (MBH)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
-
y = 0.0144x + 6.3764
R2 = 0.9999
y = 0.0115x + 5.1011
R2 = 0.9999
-
20
40
60
80
100
120
140
160
180
Thousands
Normalized Seasonal Gas Use (m3/yr)
Minimum
25% Oversize

Appendix C
ANNUAL SEASONAL EFFICIENCY

Boiler Selection Tool

Program Ver.e1-06 - 01-Jul-07

Project ID: 0
Address: 0
ESC Name: 0

Business Partner: Small Commercial
Customer: TRC Analysis [600 MBH]
Date: 25-May-09

Base Case (81%)

	Manufacturer	Model	Qty	Unit Input ('000 Btu/h)	Total Input ('000 Btu/h)	Combustion Efficiency (%)	Heating Ouput ('000 Btu/h)	Seasonal Efficiency (%)	Estimated Annual Gas Usage (m3)
Space Heating (Seasonal)									
Existing #1	Other Boiler		**1**	600	600	600	81	81	486		
Existing #2	None		**0**	-	-	-	-		
				Sub-Total	**600**	**81.0**	**486**	**62.58**	**20,945**
Domestic Hot Water (Non-Seasonal)									
Existing #1	Other Boiler		**1**	600	600	600	81	81	486		
Existing #2	None		**0**	-	-	-	-		
				Sub-Total	**600**	**81.0**	**486**	**65.56**	**18,962**
								Totals	**39,907**

--

Mid Efficiency (83.5%)

Final Selection

	Manufacturer	Model	Qty	Unit Input ('000 Btu/h)	Total Input (MBH)	Combustion Efficiency (%)	Heating Ouput ('000 Btu/h)	Seasonal Efficiency (%)	Estimated Annual Gas Usage (m3)	Est. Annual Gas Savings (m3)
Space Heating (Seasonal)										
NewA #1	Other Boiler		**1**	600	600	600	83.5	83.5	501			
NewA #2	None		**0**	-	-	-	-			15.7%
				Sub-Total	**600**	**83.5**	**501**	**74.22**	**17,661**	**3,284**
Domestic Hot Water (Non-Seasonal)										
NewA #1	Other Boiler		**1**	600	600	600	83.5	83.5	501			
NewA #2	None		**0**	-	-	-	-			10.7%
				Sub-Total	**600**	**83.5**	**501**	**73.46**	**16,924**	**2,038**
								Totals	**34,585**	**5,322**
										13.3%

--

High Efficiency (86.5%)

Final Selection

	Manufacturer	Model	Qty	Unit Input ('000 Btu/h)	Total Input (MBH)	Combustion Efficiency (%)	Heating Ouput ('000 Btu/h)	Seasonal Efficiency (%)	Estimated Annual Gas Usage (m3)	Est. Annual Gas Savings (m3)
Space Heating (Seasonal)										
NewB #1	None		**0**	-	-	-	-			
NewB #2	Other Boiler		**1**	600	600	600	86.5	86.5	519			23.3%
				Sub-Total	**600**	**86.5**	**519**	**81.57**	**16,068**	**4,877**
Domestic Hot Water (Non-Seasonal)										
NewB #1	None		**0**	-	-	-	-			
NewB #2	Other Boiler		**1**	600	600	600	86.5	86.5	519			17.7%
				Sub-Total	**600**	**86.5**	**519**	**79.63**	**15,613**	**3,349**
								Totals	**31,681**	**8,226**
										20.6%

--

Condensing (90%)

	Manufacturer	Model	Qty	Unit Input ('000 Btu/h)	Total Input (MBH)	Combustion Efficiency (%)	Heating Ouput ('000 Btu/h)	Seasonal Efficiency (%)	Estimated Annual Gas Usage (m3)	Est. Annual Gas Savings (m3)
Space Heating (Seasonal)										
Lead #1	Other Boiler		**1**	600	600	600	90	90	540			26.4%
Lead #2	None		**0**	-	-	-	-			
Lead Portion 100%				**Sub-Total**	600	**90.0**	**540**	**85.07**	**15,407**	**5,538**
Domestic Hot Water (Non-Seasonal)										
Lead	Other Boiler		**1**	600	600	600	90	90	540			
Lag	None		**0**	-	-	-	-			21.1%
				Sub-Total	**600**	**90.0**	**540**	**83.13**	**14,956**	**4,006**
								Totals	**30,363**	**9,544**
										23.9%

--

Seasonal Efficiency

Project ID: 0
Address: 0
ESC Name: 0

Business Partner: Small Commercial
Customer: TRC Analysis [600 MBH]
Date: 25-May-09

Program Ver.e1-06 - 01-Jul-07

Space Heating

	Base Case		Mid Efficiency		High Efficiency		Condensing	
	Selection	Loss %	Selection	Loss %	Selection	Loss %	Selection	Loss %
Boiler Combustion Efficiency	**81.0 %**	{Average}	**83.5 %**	{Average}	**86.5 %**	{Average}	**90.0 %**	{Average}
Boiler Pumping	Continuous		Continuous		Continuous		Continuous	
Flue Damping*	None		Burner Fan		Burner Fan		Burner Fan	
Oversizing Ratio [Calculated]	1.0	[1.5]	1		1		1	
Total # Heating Stages	1		2		11		11	
Maximum Supply Water Temperature	180 F	14.40	180 F	5.24 %	180 F	2.88 %	180 F	2.88 %
Jacket Average Temp.	100 F	0.82 %	90 F	0.55 %	90 F	0.55 %	90 F	0.55 %
I/O Control with Reset	New	0.00 %	New	0.00 %	New	0.00 %	New	0.00 %
A/F Control*	None	3.20 %	Staged	2.00 %	Modulating	0.00 %	Modulating	0.00 %
Purge Cycles*	None	0.00 %	Pre or post	1.50 %	Pre or post	1.50 %	Pre or post	1.50 %
Total losses		**18.42 %**		**9.28 %**		**4.93 %**		**4.93 %**
Estimated Seasonal Efficiency		**62.58 %**		**74.22 %**		**81.57 %**		**85.07 %**

** Values set from Database*

Domestic Hot Water

	Existing		New A		New B		Lead-Lag	
	Selection	Loss %	Selection	Loss %	Selection	Loss %	Selection	Loss %
Boiler Combustion Efficiency	**81.0 %**		**83.5 %**		**86.5 %**		**90.0 %**	
Boiler Pumping	Continuous		Continuous		Continuous		Continuous	
Flue Damping*	None		Burner Fan		Burner Fan		Burner Fan	
Oversizing Ratio	1.3		1.3		1.3		1.3	
Total # Heating Stages	1		2		11		11	
Maximum Supply Water Temperature	140 F	7.15 %	140 F	2.60 %	140 F	1.43 %	140 F	1.43 %
Jacket Average Temp.	110 F	1.09 %	90 F	0.55 %	90 F	0.55 %	90 F	0.55 %
Controls	New	0.00 %	New	0.00 %	New	0.00 %	New	0.00 %
A/F Control*	None	3.20 %	Staged	2.00 %	Modulating	0.00 %	Modulating	0.00 %
Purge Cycles*	None	0.00 %	Pre or post	0.90 %	Pre or post	0.90 %	Pre or post	0.90 %
DHW Tank Insulation	Good	4.00 %	Good	4.00 %	Good	4.00 %	Good	4.00 %
Total losses		**15.44 %**		**10.04 %**		**6.87 %**		**6.87 %**
Estimated Seasonal Efficiency		**65.56 %**		**73.46 %**		**79.63 %**		**83.13 %**

** Values set from Database*

Appendix D
TRC Analysis: Seasonal Gas Use

TRC Summary: 300MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 4,000	$ 6,900	$ 7,500	$ 11,000
Additional Installation Costs		$ -	$ 1,000	$ 1,000	$ 1,000
Incremental Cost ($)		$ -	$ 3,900	$ 4,500	$ 8,000
Average Annual Gas Use (m3)	15,615	13,424	11,319	10,298	9,875
Gas Savings vs Base Case (m3)		-	2,105	3,125	3,549
Gas Savings vs Base Case ($)		$ -	$ 737	$ 1,094	$ 1,242
Net TRC (Boiler Replacement)		$ -	$ 4,543	$ 7,879	$ 6,405

TRC Summary: 400MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 5,200	$ 7,900	$ 8,900	$ 13,300
Additional Installation Costs		$ -	$ 1,000	$ 1,000	$ 1,000
Incremental Cost ($)		$ -	$ 3,700	$ 4,700	$ 9,100
Average Annual Gas Use (m3)	23,559	20,253	17,078	15,538	14,898
Gas Savings vs Base Case (m3)		-	3,175	4,715	5,355
Gas Savings vs Base Case ($)		$ -	$ 1,111	$ 1,650	$ 1,874
Net TRC (Boiler Replacement)		$ -	$ 8,772	$ 13,727	$ 12,280

TRC Summary: 500MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 6,900	$ 9,700	$ 10,900	$ 15,700
Additional Installation Costs		$ -	$ 1,800	$ 1,800	$ 1,800
Incremental Cost ($)		$ -	$ 4,600	$ 5,800	$ 10,600
Average Annual Gas Use (m3)	30,565	26,276	22,156	20,158	19,329
Gas Savings vs Base Case (m3)		-	4,120	6,118	6,947
Gas Savings vs Base Case ($)		$ -	$ 1,442	$ 2,141	$ 2,431
Net TRC (Boiler Replacement)		$ -	$ 11,561	$ 18,074	$ 16,991

TRC Summary: 600MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 8,100	$ 12,100	$ 12,300	$ 18,000
Additional Installation Costs		$ -	$ 1,800	$ 1,800	$ 1,800
Incremental Cost ($)		$ -	$ 5,800	$ 6,000	$ 11,700
Average Annual Gas Use (m3)	37,675	32,388	27,310	24,847	23,825
Gas Savings vs Base Case (m3)		-	5,078	7,541	8,563
Gas Savings vs Base Case ($)		$ -	$ 1,777	$ 2,639	$ 2,997
Net TRC (Boiler Replacement)		$ -	$ 14,134	$ 23,290	$ 22,146

TRC Summary: 700MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 8,500	$ 13,400	$ 14,900	$ 22,100
Additional Installation Costs		$ -	$ 2,500	$ 2,500	$ 2,500
Incremental Cost ($)		$ -	$ 7,400	$ 8,900	$ 16,100
Average Annual Gas Use (m3)	44,605	38,346	32,334	29,418	28,208
Gas Savings vs Base Case (m3)		-	6,012	8,928	10,138
Gas Savings vs Base Case ($)		$ -	$ 2,104	$ 3,125	$ 3,548
Net TRC (Boiler Replacement)		$ -	$ 16,265	$ 25,992	$ 24,241

TRC Summary: 800MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 10,200	$ 14,500	$ 17,100	$ 24,200
Additional Installation Costs		$ -	$ 2,500	$ 2,500	$ 2,500
Incremental Cost ($)		$ -	$ 6,800	$ 9,400	$ 16,500
Average Annual Gas Use (m3)	51,506	44,278	37,336	33,969	32,572
Gas Savings vs Base Case (m3)		-	6,942	10,309	11,707
Gas Savings vs Base Case ($)		$ -	$ 2,430	$ 3,608	$ 4,097
Net TRC (Boiler Replacement)		$ -	$ 20,316	$ 30,785	$ 29,833

TRC Summary: 1,000MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 12,200	$ 17,100	$ 20,000	$ 28,600
Additional Installation Costs		$ -	$ 2,500	$ 2,500	$ 2,500
Incremental Cost ($)		$ -	$ 7,400	$ 10,300	$ 18,900
Average Annual Gas Use (m3)	61,370	52,758	44,486	40,475	38,810
Gas Savings vs Base Case (m3)		-	8,272	12,283	13,949
Gas Savings vs Base Case ($)		$ -	$ 2,895	$ 4,299	$ 4,882
Net TRC (Boiler Replacement)		$ -	$ 24,827	$ 37,471	$ 36,215

TRC Summary: 1,200MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 13,700	$ 18,600	$ 21,000	$ 30,360
Additional Installation Costs		$ -	$ 2,700	$ 2,700	$ 2,700
Incremental Cost ($)		$ -	$ 7,600	$ 10,000	$ 19,360
Average Annual Gas Use (m3)	75,451	64,863	54,694	49,761	47,714
Gas Savings vs Base Case (m3)		-	10,170	15,102	17,149
Gas Savings vs Base Case ($)		$ -	$ 3,559	$ 5,286	$ 6,002
Net TRC (Boiler Replacement)		$ -	$ 31,842	$ 48,416	$ 47,934

TRC Summary: 1,500MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 18,100	$ 21,000	$ 22,500	$ 33,000
Additional Installation Costs		$ -	$ 3,000	$ 3,000	$ 3,000
Incremental Cost ($)		$ -	$ 5,900	$ 7,400	$ 17,900
Average Annual Gas Use (m3)	92,238	79,295	66,862	60,833	58,330
Gas Savings vs Base Case (m3)		-	12,432	18,462	20,965
Gas Savings vs Base Case ($)		$ -	$ 4,351	$ 6,462	$ 7,338
Net TRC (Boiler Replacement)		$ -	$ 41,908	$ 63,433	$ 63,676

TRC Summary: 2,000MBH Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	53.8%	62.6%	74.2%	81.6%	85.1%
Boiler MSRP ($)		$ 23,300	$ 25,000	$ 27,100	$ 39,000
Additional Installation Costs		$ -	$ 3,250	$ 3,250	$ 3,250
Incremental Cost ($)		$ -	$ 4,950	$ 7,050	$ 18,950
Average Annual Gas Use (m3)	119,434	102,674	86,576	78,769	75,528
Gas Savings vs Base Case (m3)		-	16,098	23,905	27,146
Gas Savings vs Base Case ($)		$ -	$ 5,634	$ 8,367	$ 9,501
Net TRC (Boiler Replacement)		$ -	$ 56,633	$ 84,363	$ 86,170

Appendix E
TRC Analysis: Non-Seasonal Gas Use

TRC Summary: 300MBH Non-Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	57.2%	65.6%	73.5%	79.6%	83.1%
Boiler MSRP ($)		$ 4,000	$ 6,900	$ 7,500	$ 11,000
Additional Installation Costs		$ -	$ 1,000	$ 1,000	$ 1,000
Incremental Cost ($)		$ -	$ 3,900	$ 4,500	$ 8,000
Average Annual Gas Use (m3)	11,468	9,999	8,924	8,233	7,886
Gas Savings vs Base Case (m3)		-	1,075	1,766	2,113
Gas Savings vs Base Case ($)		$ -	$ 376	$ 618	$ 739
Net TRC (Boiler Replacement)		$ -	$ 274	$ 2,128	$ 244

TRC Summary: 400MBH Non-Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	57.2%	65.6%	73.5%	79.6%	83.1%
Boiler MSRP ($)		$ 5,200	$ 7,900	$ 8,900	$ 13,300
Additional Installation Costs		$ -	$ 1,000	$ 1,000	$ 1,000
Incremental Cost ($)		$ -	$ 3,700	$ 4,700	$ 9,100
Average Annual Gas Use (m3)	15,378	13,408	11,967	11,040	10,575
Gas Savings vs Base Case (m3)		-	1,441	2,368	2,833
Gas Savings vs Base Case ($)		$ -	$ 504	$ 829	$ 992
Net TRC (Boiler Replacement)		$ -	$ 1,712	$ 4,028	$ 1,759

TRC Summary: 500MBH Non-Seasonal Boiler 1/0/1900

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	57.2%	65.6%	73.5%	79.6%	83.1%
Boiler MSRP ($)		$ 6,900	$ 9,700	$ 10,900	$ 15,700
Additional Installation Costs		$ -	$ 1,800	$ 1,800	$ 1,800
Incremental Cost ($)		$ -	$ 4,600	$ 5,800	$ 10,600
Average Annual Gas Use (m3)	19,841	17,299	15,440	14,244	13,644
Gas Savings vs Base Case (m3)		-	1,859	3,055	3,655
Gas Savings vs Base Case ($)		$ -	$ 651	$ 1,069	$ 1,279
Net TRC (Boiler Replacement)		$ -	$ 2,361	$ 5,428	$ 3,273

TRC Summary: 600MBH Non-Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	57.2%	65.6%	73.5%	79.6%	83.1%
Boiler MSRP ($)		$ 8,100	$ 12,100	$ 12,300	$ 18,000
Additional Installation Costs		$ -	$ 1,800	$ 1,800	$ 1,800
Incremental Cost ($)		$ -	$ 5,800	$ 6,000	$ 11,700
Average Annual Gas Use (m3)	24,184	21,085	18,819	17,361	16,630
Gas Savings vs Base Case (m3)		-	2,266	3,724	4,455
Gas Savings vs Base Case ($)		$ -	$ 793	$ 1,303	$ 1,559
Net TRC (Boiler Replacement)		$ -	$ 2,708	$ 7,559	$ 5,063

TRC Summary: 700MBH Non-Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	57.2%	65.6%	73.5%	79.6%	83.1%
Boiler MSRP ($)		$ 8,500	$ 13,400	$ 14,900	$ 22,100
Additional Installation Costs		$ -	$ 2,500	$ 2,500	$ 2,500
Incremental Cost ($)		$ -	$ 7,400	$ 8,900	$ 16,100
Average Annual Gas Use (m3)	28,597	24,933	22,254	20,529	19,665
Gas Savings vs Base Case (m3)		-	2,679	4,404	5,268
Gas Savings vs Base Case ($)		$ -	$ 938	$ 1,541	$ 1,844
Net TRC (Boiler Replacement)		$ -	$ 2,724	$ 7,351	$ 3,994

TRC Summary: 800MBH Non-Seasonal Boiler 1/0/1900

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	57.2%	65.6%	73.5%	79.6%	83.1%
Boiler MSRP ($)		$ 10,200	$ 14,500	$ 17,100	$ 24,200
Additional Installation Costs		$ -	$ 2,500	$ 2,500	$ 2,500
Incremental Cost ($)		$ -	$ 6,800	$ 9,400	$ 16,500
Average Annual Gas Use (m3)	33,031	28,799	25,704	23,712	22,714
Gas Savings vs Base Case (m3)		-	3,095	5,087	6,085
Gas Savings vs Base Case ($)		$ -	$ 1,083	$ 1,780	$ 2,130
Net TRC (Boiler Replacement)		$ -	$ 4,686	$ 9,266	$ 6,459

TRC Summary: 1,000MBH Non-Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	57.2%	65.6%	73.5%	79.6%	83.1%
Boiler MSRP ($)		$ 12,200	$ 17,100	$ 20,000	$ 28,600
Additional Installation Costs		$ -	$ 2,500	$ 2,500	$ 2,500
Incremental Cost ($)		$ -	$ 7,400	$ 10,300	$ 18,900
Average Annual Gas Use (m3)	39,644	34,565	30,850	28,460	27,261
Gas Savings vs Base Case (m3)		-	3,715	6,105	7,303
Gas Savings vs Base Case ($)		$ -	$ 1,300	$ 2,137	$ 2,556
Net TRC (Boiler Replacement)		$ -	$ 6,296	$ 11,983	$ 8,546

TRC Summary: 1,200MBH Non-Seasonal Boiler 5/25/2009

Gas Cost **$ 0.35** **$/m3**

Combustion Efficiency %	Existing 75%	Base Case 80-82%	83-84%	85-88%	89+%
Ave. Combustion Eff. %	75%	81%	83.5%	86.5%	90%
Annual Seasonal Eff. %	57.2%	65.6%	73.5%	79.6%	83.1%
Boiler MSRP ($)		$ 13,700	$ 18,600	$ 21,000	$ 30,360
Additional Installation Costs		$ -	$ 2,700	$ 2,700	$ 2,700
Incremental Cost ($)		$ -	$ 7,600	$ 10,000	$ 19,360
Average Annual Gas Use (m3)	46,075	40,172	35,855	33,076	31,684
Gas Savings vs Base Case (m3)		-	4,317	7,095	8,488
Gas Savings vs Base Case ($)		$ -	$ 1,511	$ 2,483	$ 2,971
Net TRC (Boiler Replacement)		$ -	$ 8,195	$ 15,661	$ 12,226

Appendix F
REFERENCES

References:

1. EPRI. 1990. Commercial heat pump water heaters applications handbook. CU-6666. Electric Power Research Institute, Palo Alto, CA.

2. Department of Energy, May 2000. Commercial heat pump water heaters. Federal Technology Alert.

3. Goldner, F.S. 1994b. DHW system sizing criteria for multifamily buildings. ASHRAE Transactions 100(1):963-977.

4. HVAC Applications, 2007, ASHRAE Handbook, I-P Edition.

5. Thrasher, W.H. and D.W. DeWerth. 1994. New hot-water use data for five commercial buildings (RP-600). ASHRAE Transactions 100(1):935-947.

GEC INTERROGATORY #11

INTERROGATORY

Ref: Exhibit B, Tab 3, Schedule 5

Are any of the custom measure lives proposed in this schedule different from those previously approved for 2008? If so, which are different, what are the differences and what is the basis for any differences?

RESPONSE

The custom measure lives presented in Exhibit B, Tab 3, Schedule 5 are consistent with those approved for 2008.

Witnesses: M. Brophy
P. Squires

GEC INTERROGATORY #12

INTERROGATORY

The Company states that the new 2010 pilot programs are "not proposed to have any SSM or target impacts" (Exhibit B, Tab 4, Schedule 1, p. 1, paragraph 2). Does that mean that the Company will not claim any savings from any measures installed in facilities covered by the pilot initiatives? If the answer is that the Company reserves the right to claim savings, TRC net benefits and SSM rewards for efficiency measures installed in such facilities, how does it proposed to adjust for the impact the metering or other support from the pilot initiatives may have had in promoting the efficiency investments?

RESPONSE

The pilot program is intended to investigate the removal of barriers and assist in building a conservation culture in these facilities. As such, it is not expected to directly result in savings for 2010, but could have long term benefits for building Ontario's Conservation Culture. To the extent that it can assist in removing barriers for energy efficiency, these effects will likely occur beyond 2010. Based on the results of this pilot project, Enbridge can assess options beyond 2010.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #1

INTERROGATORY

Reference: Ex B/1/1/para. 3.

EGD states: The 2010 DSM Plan will be adjusted over time as may be required to respond to changes in the marketplace, new barriers, new opportunities, and to optimize the DSM portfolio. How and when would Ontario Energy Board approval for any such changes be sought?

RESPONSE

The portfolio flexibility outlined in the 2010 DSM Plan is consistent with the flexibility that Enbridge has had throughout the multi-year plan. No additional approvals are anticipated this time. Should a modification be required that can not be addressed within the existing Board approved framework, Enbridge would follow the procedure outlined in theEB-2006-0021 Decision.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #2

INTERROGATORY

Reference: Ex B/1/2.

Please confirm that the O&M costs set out on lines 12 and 22 are the only DSM related costs attributable to industrial customer DSM programs for the 2010 program year. If this is not the case, please list the other costs attributable to industrial customer DSM programs in the program year.

RESPONSE

With reference to Exhibit B, Tab 1, Schedule 2, titled “Table 1 – Summary of 2010 Budget”, the O&M costs set out on lines 12 and 22 are the only directly related costs attributable to industrial customer DSM programs for the 2010 program year. However, a portion of line 19 is also prorated to all sectors.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #3

INTERROGATORY

Reference: Ex B/1/2.

Please provide the industrial DSM O&M expenses for each of the 2009, 2008 and 2007 program years.

RESPONSE

The Industrial O&M costs for 2009, 2008, and 2007 are:

- 2009 (Budget) $2,879,088
- 2008 (Actual) $1,950,347
- 2007 (Actual) $2,140,779

Note: Excludes Agriculture and Program Development expenditures.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #4

INTERROGATORY

Reference: Ex B/2/1/p.9.

The evidence does not indicate any expenses associated with the Capital Financing Program. Please explain the status of this program, identify any expenditures anticipated in connection with this program in the 2010 program year, and if expenditures are anticipated indicate where in the filing such expenditures are subsumed. Please provide any input assumptions or evaluation metrics associated with this program for the 2010 program year.

RESPONSE

The Capital Financing Program was identified through recent direct feedback from industrial customers and options are under development. Based on current information, Industrial program participants would have the option to accepting their normal incentives as a direct payment, or the incentives would be used to cover the costs of financing and the interest rate buy down. Eligible customers would need to meet program conditions yet to be defined. As the financing program would be offered as an alternative to a cash incentive, no incremental costs are anticipated to be associated with this program.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #5

INTERROGATORY

Reference: Ex B/2/1/p.15.

The information provided for the Industrial Custom Resource Acquisition Program indicates "industry associations" as one of the "delivery channels". Please identify which industry associations will be participating in delivery of this program.

RESPONSE

Industry Association will be selected based on their interest, competencies and ability to achieve results. Discussions to date have included the Industrial Gas Users Association (IGUA), Canadian Manufacturers and Exporters (CME) and the Canadian Industry Program for Energy Conservation (CIPEC) to help deliver the Industrial Program.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #6

INTERROGATORY

Reference: Ex B/2/1/p.15.

Does any part of the industrial DSM programming described in the referenced exhibit include monitoring and targeting activities and/or the collection of metering data to facilitate energy efficiency interventions? If so, approximately how much of the total program budget is forecast to be spent on such activities?

RESPONSE

The Industrial DSM program described in EB-2009-0154 at Exhibit B, Tab 2, Schedule 1, page 15 does contain basic costs attributed to current levels of support for Monitoring and Targeting. There is approximately $310,000 budgeted for incentives and another $314,000 for audit support.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #7

INTERROGATORY

Reference: Ex B/2/1/p.15.

Please provide detailed calculations, and any associated background material, to facilitate evaluation of the gas savings, equipment life and free ridership estimates listed for the Industrial Custom Resource Acquisition Program. Please also include the following information in the response:

(a) A breakdown among component activities of the total variable costs budgeted for the program.

(b) The basis for deriving the fixed costs allocated to the program.

RESPONSE

Gas savings for Industrial custom projects are estimated individually for each completed project. Gas savings estimates are based on third-party engineering studies and/or feasibility studies, or on custom calculations by the Enbridge Energy Solutions Consultant. Copies of relevant back-up material supporting the gas savings claims are retained by Enbridge and kept in each custom project file. These files are made available for review to the DSM Auditor after the year is complete.

A discussion on the background for the free ridership and measure life assumptions is presented at Exhibit B, Tab 3, Schedule 1, pages 2 to 3 , and summary tables presented at Exhibit B, Tab 3, Schedules 4 and 5, respectively.

a) The variable costs budgeted for the Industrial Custom Program are for incentives paid to the customer for implementation of DSM measures.

b) The fixed costs budgeted for the Industrial Custom Program are based on program support activities including workshops and tradeshows to expand the knowledge of customers and build capacity amongst our business partners to provide energy services, subsidies for energy assessments to help customers identify energy cost savings opportunities, and customer research to ascertain ways to improve existing programs and develop new programs.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #8

INTERROGATORY

Reference: Ex. B/3/2, p.8.

Please provide the basis (other than reference to previous OEB decisions) for the 50% free rider assumption for industrial DSM initiatives.

RESPONSE

On October 27, 2008, Summit Blue Consulting submitted a final report titled “Custom Projects Attribution Study Final”. The 50% free ridership assumption can be found on page iv, Table E-3 Net-to-Gross Ratio.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #9

INTERROGATORY

Reference: Ex. B/3/5.

Please produce a table which includes the first (list of technologies) and third (industrial measure life assumptions) columns, and adds one or more columns indicating previous values for the individual measure life assumptions back to the October 18, 2006 decision in EB-2006-0021. Please confirm that but for the 4 assumptions for which footnoted data sources are included on the table as filed, all other values remain as approved in EB-2006-0021.

RESPONSE

Please see table provided on the following page.

Witnesses: M. Brophy
P. Squires

Custom Resource Acquisition Technologies
Measure Life Assumption

	Industrial	2006	2007	2008	2009
Boiler Related					
Boilers – DHW	n/a	n/a	n/a	n/a	n/a
Boilers - Industrial Process	20	20	20	20	20
Boilers – Space Heating	25 [1]	25	25	25	25
Combustion Tune-up	5	5	5	5	5
Controls	15	15	15	15	15
Steam pipe/tank insulation	15	15	15	15	15
Steam trap	13 [3]	3	3	13	13
Building Related					
Building envelope	25	25	25	25	25
Windows	25	25	25	25	25
Greenhouse curtains	10	10	10	10	10
Double Poly greenhouse	5	5	5	5	5
HVAC Related					
Dessicant cooling	n/a	n/a	n/a	n/a	n/a
Heat Recovery	15	15	15	15	15
Infra-red heaters	10	10	10	10	10
Make-up Air	15	15	15	15	15
Novitherm panels	n/a	n/a	n/a	n/a	n/a
Furnaces (gas-fired)	n/a	n/a	n/a	n/a	n/a
Re-Commissioning	n/a	n/a	n/a	n/a	n/a
Process Related					
Furnaces (gas-fired)	18 [2]	18	18	18	18

Source: EB-2006-0021.
[1]Source: ASHRAE
[2]Source: ASHRAE updated in EB-2006-0021
[3]Source: Measure Life of Steam Traps Research Study, Enbridge Gas Distribution, November, 2007

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #10

INTERROGATORY

Reference: Ex. B/3/5.

Please file a copy of the EGD study referenced in footnote 3 to the table (regarding measure life for industrial steam traps).

RESPONSE

A copy of the EGD study referenced in EB-2009-0154 at Exhibit B, Tab 3, Schedule 5 in footenote 3 is attached.

Customer specific information has been removed.

Witnesses: M. Brophy
P. Squires

Enbridge Gas Distribution
DSM Program Assumption Update

Assumption	Measure Life of Steam Traps	
Recommendation	Increase Measure Life from 3 years to 13 years	
Authors	Terry Whitehead, P.Eng., Pirapa Tharmalingam, Robert Griffin, P.Eng.	
Date	November, 2007	

Steam Traps

Steam traps are automatic valves that release condensed steam (*water)* from a steam space while preventing the loss of steam vapour. They also remove non-condensable gases from the steam space. Steam traps are designed to maintain steam energy efficiency for performing specific tasks such as heating a building or maintaining heat for process use. Once steam has transferred heat through a process and becomes hot water, it is removed by the trap from the steam side as condensate and returned to the boiler via condensate return lines. Alternatively, the condensate is discharged, simply wasting water and energy.

How Steam Traps Work

Steam is an invisible gas generated by adding heat energy to water in a boiler. When enough energy is added to raise the temperature of the water to the boiling point, additional energy (called the heat of vapourization or latent heat) is added which changes that water into steam. Steam is an extremely efficient and easily controlled heat transfer medium. It is most often used for transporting energy from a boiler to any number of locations in the plant where it is used to heat air, water or process applications.

During this transportation of energy, condensate is generated in the distribution system due to unavoidable radiative energy losses. It also forms in heating and process equipment as a result of heat being transferred from the steam to the substance heated. Once the steam has condensed and lost its latent heat, the hot condensate must be removed immediately or it can cause water hammer which can damage the steam system and compromise its safe operation. While the available heat in a pound of condensate is negligible as compared to a pound of steam, condensate is still valuable hot water and should be returned to the boiler. This is where a steam trap comes in.

Measure Life for Total Resource Cost Calculation

In the Settlement Agreement for the Enbridge Gas Distribution 2003 DSM Program, a steam trap measure life of 3 years was agreed on between the parties (RP-2002-0133, Ex. N1, Tab 1, Sch.1, Pg. 64).

Steam traps are simple devices whose performance is generally overlooked in the field; consequently there is little information available regarding the operating life of a unit.

Since the introduction of the "steam trap audit program" at Enbridge in 1998, 216 audits have been completed through third parties, providing a significant amount of data that has enabled Enbridge to statistically establish the average operating life of a steam trap. We have seen that the operating life is many times longer than the original 3 year prediction and we believe that this field data has shown that a longer measure life can be used to calculate the TRC net benefits for the measure (Total Resource Cost).

The lifespan of a steam trap is defined as the time from installation of a unit to the time when it has failed. There are two forms of failure; blockage which essentially reduces or stops the passage of steam to a energy consuming device, and leakage which allows the device to continue to work although energy is lost through the leakage of steam to the atmosphere.

Of the two failure modes identifying leaking steam traps, and fixing them, provides the most significant energy savings opportunity as there are no telltale signs that the system is not operating as it should unless the trap is tested. Therefore, without testing, energy loss would continue without notice for many years.

In practice, there are a number of factors which determine the lifespan of a steam trap:

- Type of trap.
    - Thermostatic
    - Thermodynamic
    - Float and Thermostatic
    - Inverted Bucket

- Duty load (light or heavy usage). If the usage is heavy, the trap will operate (open and close) much more frequently than one which is lightly loaded.
- Maintenance level, having adequate strainers installed and anti corrosion practices in place. When piping debris reaches a steam trap, it may interfere with opening and closing

Evaluation of Average Life-span

Enbridge has conducted 216 steam trap surveys (to the end of 2005) through our Industry Partners Spirax Sarco and Preston Phipps. These surveys were completed over a period of about 7 years.

At a large majority of sites where surveys were completed, no systematic inspection program for steam traps ever existed. In some cases, owners had a policy of finding and replacing badly leaking traps when leaks were identified by steam plumes coming from vents. The average age of traps which were in existence at the time of the survey is not known, but in most cases, plant personnel cannot remember ever having done a survey.

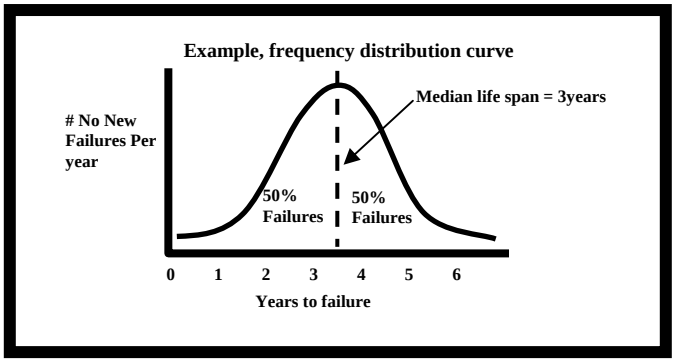
Traps were rarely tagged (an indication that a survey had never been done). Many traps were from suppliers which no longer exist, that is, they were more than 20 years old.

In other words, the general finding in the vast majority of cases of the 216 surveys done to the end of 2005 was that the traps were quite old and poorly maintained on average.

The results of the surveys were as follows:

- 216 surveys
- 41,124 traps tested
- 16.3% of traps leaking
- 7.7% of traps blocked
- Estimated average age of traps tested 10+ years
- Total defect rate: 24.0%

Based on a normal frequency distribution curve, and the negotiated three-year lifespan, we would have expected 50% of the traps to have failed by the third year of operation. We would also have expected to have over 90% of the units to have failed after 6 years. Data from the 216 steam trap audits has shown a much longer life cycle.



Although the data of all 216 steam trap audits is not statistically comparable the defect rate of 24% would indicate that the average age of the traps in the population would be much greater than 3 years. To produce a statistically valid calculation of the operating life for the steam traps, audited data from sites where more than one audit was completed on the same steam traps is required.

Sites Having Multiple Audits

Of the 216 steam trap audits, four sites provided multiple audits over many years of inspecting the same steam traps. This information was used to develop a statistical evaluation of the life span of a steam trap. At these sites the steam traps were tagged during the first audit which allowed subsequent audits to track specific steam traps. To complete a life analysis the steam traps which were replaced or repaired during the first audit provide a base year for the equipment.

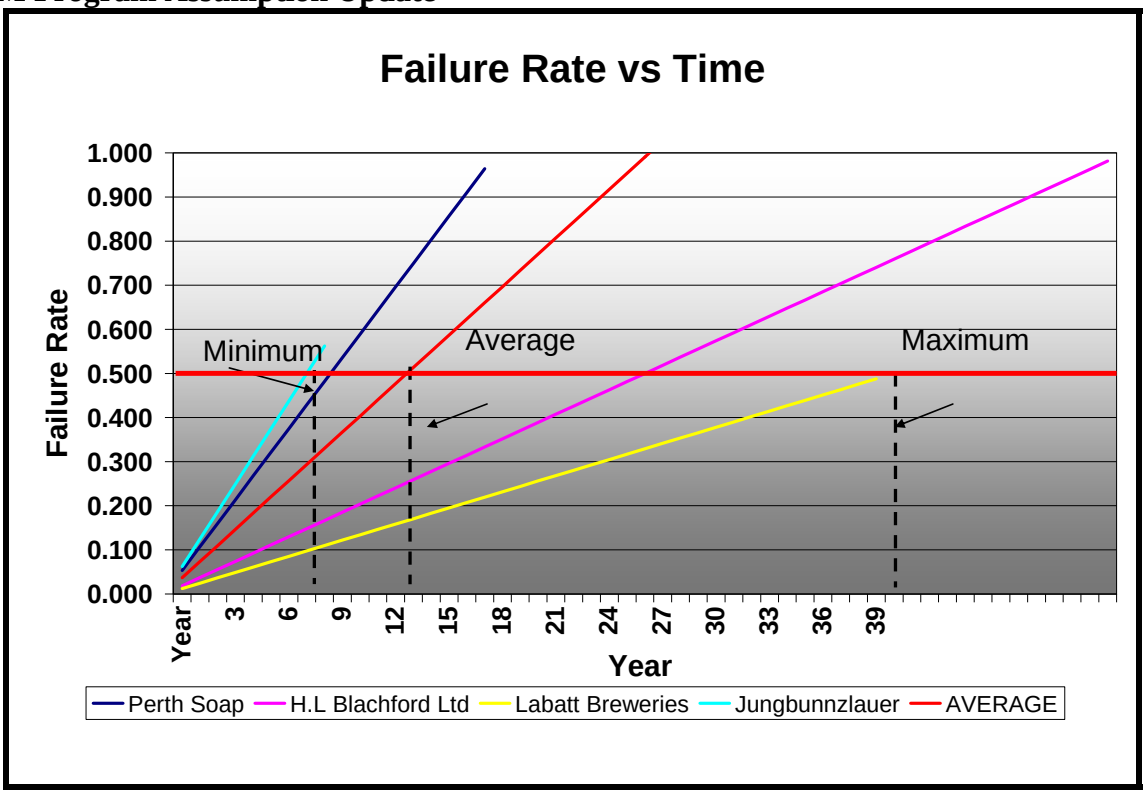
Each of the sites provided two audits of the same steam traps. The base year varied from 2001 to 2004, and the follow-up study year was either 2 years, or 4 years apart. The total number of leaking traps was separated. It was understood that the four companies did not repair or replace any of the steam traps between the two audit years therefore this data provides reasonable life operation of the steam traps that were replaced in the base year.

Analysis of Data

A linear approximation approach was employed to determine a reasonable steam trap life span. It is evident from the data presented in the previous table that various units fail at various rates. However, using the data we can conclude the "average" years it takes for 50% of the units to fail, as outlined on the previous page. A linear approximation methodology is used to extrapolate average yearly failure rates of the units for each customer.

The average yearly failure rate is assumed to be linear and it varies per customer. This introduces the necessary variability within the data set. At one point, depending on the failure rate, 100% of the units would have failed and it is assumed that all will have been replaced at some point in time. By doing so, the number of units are kept constant (i.e. the units are replaced every year as they fail) throughout the test period, and the entire sample will be replaced when 100% of them fail. This process can be continued to infinity for all customers listed on the spreadsheet.

Then an average of the yearly failure of all customers is calculated. Some time between year 13 and 14, 50% of the sample would have failed if the linearly approximated trend were to be continued into the future. It is safe to conclude that, on average, at the 13^{th} year 50% of the units would have failed. Based on the data the minimum expected life span would be 8 years and the maximum would be 41 years. This analysis has its own limitations; such as the source of the data, assumed linear growth, lack of knowledge on how often the units are used etc. However, this does provide strong support for the “average life” of 13 years.



Other Information

One steam trap manufacturer offers a three year warranty on many of its steam traps indicating their confidence that the average life of their product is much longer than three years.

Recommendation: Steam Trap Audit measure life

1. Adopt a measure life of 13 years for steam traps. Our evaluation of the average lifespan of a steam trap is conservatively calculated as 13 years.

2. Continue with research at the four sites studied. Additional data at the four sites used for this analysis would increase the accuracy of the analysis and would improve the accuracy of the average measure life. We will be pursuing an ongoing program of testing steam traps at selected sites and recommend that this analysis be updated based on the results.

IGUA INTERROGATORY #11

INTERROGATORY

Reference: Ex. B/4/1.

Union Gas, in its 2010 DSM Plan (EB-2009-0166) at page 25 describes an "Energy Monitoring and Targeting" program, which includes both simple energy metering systems and complex systems which add multiple meters, advanced monitoring software and control systems. Union includes this program in its current DSM portfolio. Please explain why what appears to be a similar program is proposed by Enbridge as a "pilot", at incremental DSM budget of $1 million.

RESPONSE

Enbridge is unable to comment on the approach of the Union Gas program. However, the industrial customer profile is significantly different between Union Gas and Enbridge and that is likely to cause some differences in approach. The proposed metering support program is more similar to a market transformation program in that it is intended to remove the market barriers (e.g., the cost of metering equipment) that are currently preventing industrial customers from participating in the existing resource acquisition program.

Witnesses: M. Brophy
P. Squires

IGUA INTERROGATORY #12

INTERROGATORY

Reference: Ex. B/4/1/p.4. Please confirm that the full-time marketing manager who will cost $100,000 in support of the proposed industrial sector pilot metering program will be an incremental hire. (If this is not the case, where is this individual being transferred from?)

RESPONSE

The full-time marketing manager in support of the proposed industrial sector pilot metering program is proposed to be an incremental hire.

Witnesses: M. Brophy
P. Squires

LIEN INTERROGATORY #1

INTERROGATORY

Please point in the evidence to, or otherwise provide details of, the number and type of residential participants in the DSM program, exclusive of low-income.

RESPONSE

The estimated number of participants in each 2010 program can be found at EB-2009-0154, Exhibit B, Tab 2, Schedule 1, pages 1 to 8.

The table below summarizes the residential program details.

Program	# of Participants	Fixed Costs per Participant	Incentive Cost per Participant	Total Costs	Growth Potential
Residential					
Novitherm Panels	4,000	$16.25	$229.00	$981,000	Defined market potential, declining opportunity
Programmable Thermostat	14,000	$6.07	$15.00	$295,000	Increasing market saturation, declining opportunity
TAPS Water Conservation	136,500	$0.51	$32.78	$4,543,074	Increasing market saturation
New Construction					
Energy Savings Kit	10,000 (60,000 measures)	$5.00	$86.65	$916,500	New program
Energy Star for New Homes V#3	2,200	$45.46	$100.00	$320,000	Increasing participation through to Dec. 31, 2011
Energy Star for New Homes V#4	300	$100.00	$100.00	$60,000	New version of technical standards
Total Residential	167,000			$7,115,574	

Witnesses: M. Brophy
P. Squires

LIEN INTERROGATORY #2

INTERROGATORY

Please confirm that, in addition to removing the allocation of funds for low-income consumers from the DSM budget, Enbridge has also adjusted all related metrics (for example, but not limited to, number of participants and TRC) to exclude low-income consumers. Please provide supporting figures.

RESPONSE

As per Board direction, targeted low-income programs were not included in the 2010 DSM Portfolio submitted in this proceeding. The metrics for targeted low-income programs have not yet been developed for 2010 and are the subject of a separate Board process.

Witnesses: M. Brophy
P. Squires

LIEN INTERROGATORY #3

INTERROGATORY

Please point in the evidence to, or otherwise provide details of, the number of participants, costs and incentives in the Enbridge DSM program for residential consumers, (a) in aggregate, (b) broken out into residential types (eg. single-family dwelling, multi-occupancy etc.), and, in each case, (c) broken out into basic and deeper measures.

RESPONSE

(a) Please refer to LIEN Interrogatory #1 at Exhibit I, Tab 7, Schedule 1 for participants, costs and incentives in the Enbridge DSM programs for residential consumers.

(b) The residential programs are offered to Rate One customers that reside in low rise or multi family units that are individually metered.

(c) Refer to LIEN Interrogatory #1 at Exhibit I, Tab 7, Schedule 1 for a list of measures in the 2010 Enbridge DSM programs for residential consumers.

Witnesses: M. Brophy
P. Squires

LIEN INTERROGATORY #4

INTERROGATORY

Please point in the evidence to, or otherwise provide details of, what residential communities will be targeted for outreach in the Enbridge DSM program and how outreach of those selected communities will be achieved.

RESPONSE

The Residential Programs employ a mass market approach to natural gas customers or a subset of customers based on equipment type.

Witnesses: M. Brophy
P. Squires

LIEN INTERROGATORY #5

INTERROGATORY

Please point in the evidence to, or otherwise provide details of, and trend for growth or otherwise in the numbers reached by and participating in Enbridge's residential DSM programs. Please supply supporting figures.

RESPONSE

Please refer to LIEN Interrogatory #1 found at Exhibit I, Tab 7, Schedule 1 for growth characteristics of each residential program.

Witnesses: M. Brophy
P. Squires

LIEN INTERROGATORY #6

INTERROGATORY

Please point in the evidence to, or otherwise provide details of, how Enbridge measures the effectiveness of its programs in terms of the benefit to residential consumers beyond costs saved by the measures.

RESPONSE

Enbridge has conducted studies that identify benefits beyond costs saved by the measure. This was most recently documented as spillover effects in the same Summit Blue study used to identify free ridership. However, based on the objection of some intervener groups, consideration of these benefits has been deferred until the next multiyear framework and are ignored for the current multi-year plan that now includes 2010.

Witness: M. Brophy
P. Squires